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Vol. 16.

Toronto, Canada, February 12th, 1909.

No. 7.

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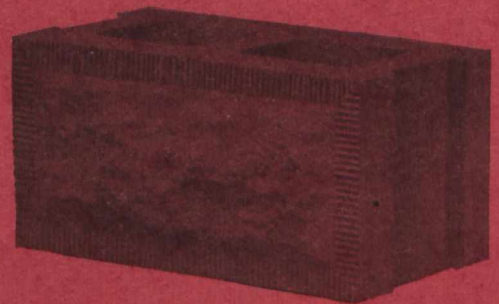
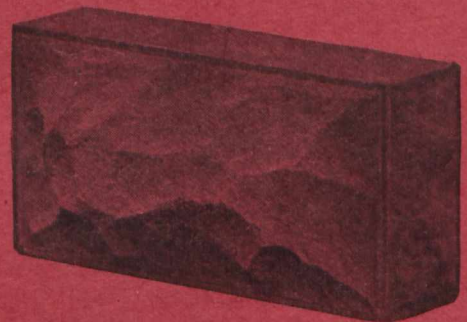
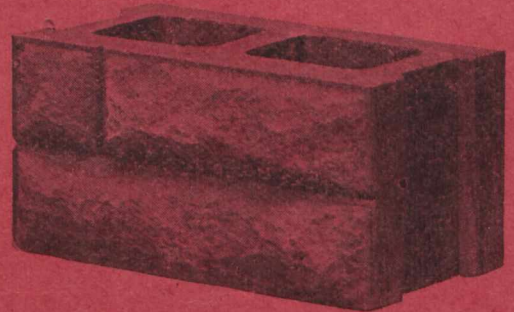
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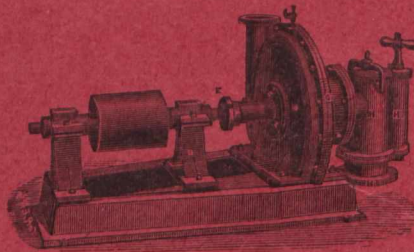
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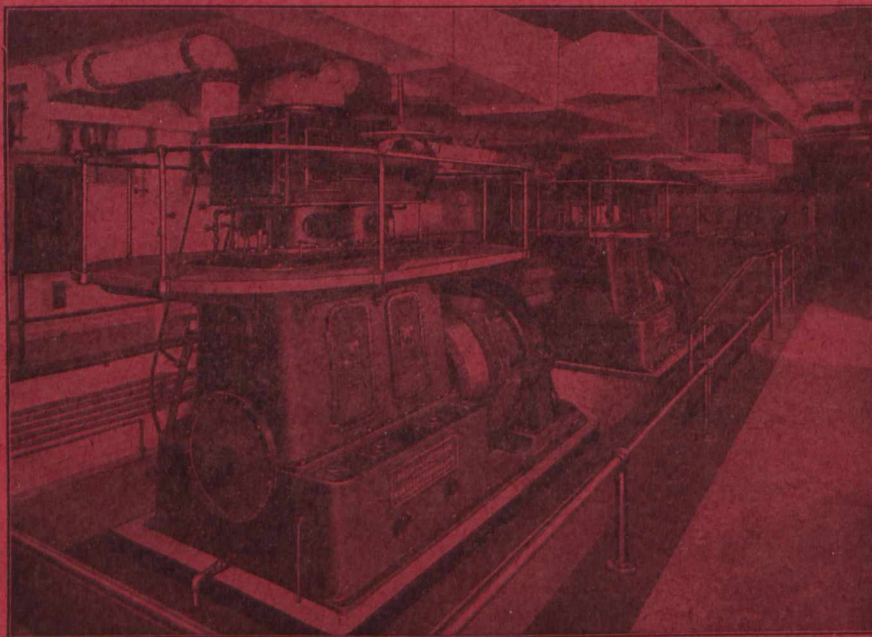
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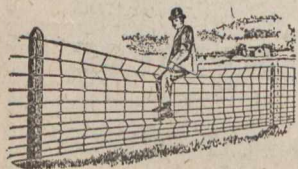
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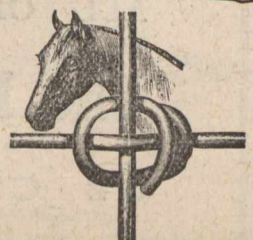
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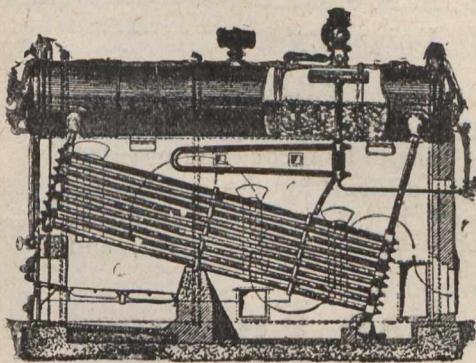
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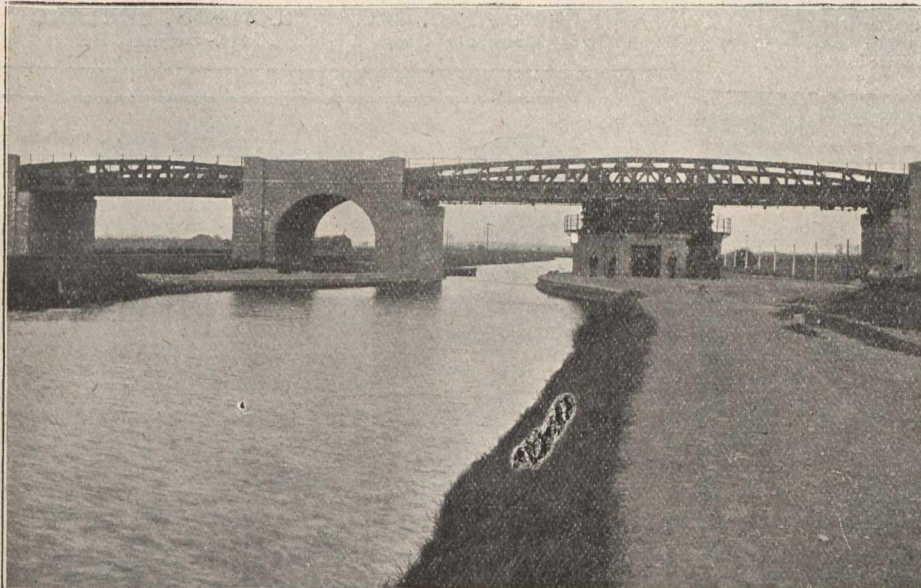
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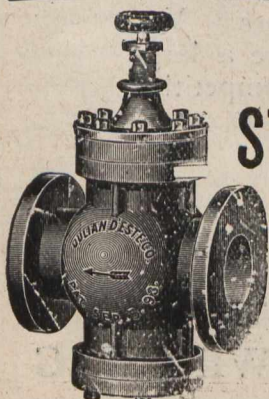
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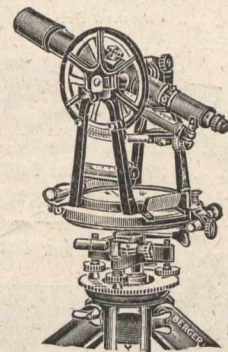
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**Haileybury, Ont.**—Mayflower Silver Mining Company, \$150,000; A. R. Newton, F. K. Ebbitt, J. J. O'Brien.

**West Toronto.**—Waste Products Refining Company, \$35,000; G. H. Bostock, J. F. Mitchell, R. J. Richardson.

**Three Rivers, Que.**—St. Maurice River Boom and Driving Company, \$25,000; R. F. Grant, J. M. Dalton, A. Baptist.

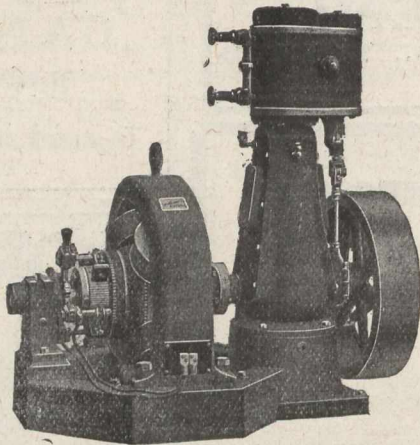
**Hespeler, Ont.**—Hespeler Machinery Company, \$100,000; W. G. Chater, Hespeler; T. F. Campbell, M. A. Secord, Galt.

**Ottawa, Ont.**—Bartram Bros., \$20,000; W. B. Bartram, Ottawa; J. B. Bartram, C. D. Bartram, Toronto. Fraser Bryson Lumber Company, \$40,-

(Continued on Page 45)

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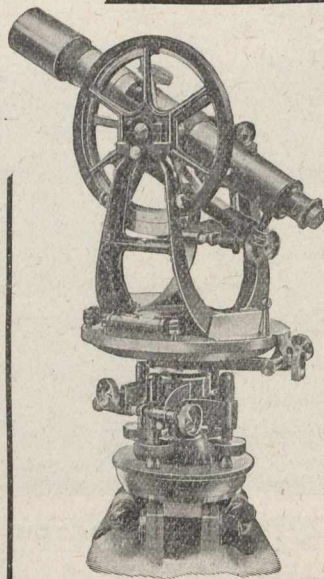
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# The Canadian Engineer

WEEKLY

ESTABLISHED 1893

VOL. 16.

TORONTO, CANADA, FEBRUARY 12th, 1909.

No. 7

## The Canadian Engineer

ESTABLISHED 1893.

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TORONTO, CANADA, FEBRUARY 12, 1909.

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Binders for filing six months' copies of The Canadian Engineer can be obtained from our Book Department. They are durable and useful, being made so that old copies may be replaced by more recent issues, if desired. The name of the publication appears in gilt letters on the cover, which is half leather. Price, \$1.25.

### ELECTRIC SMELTING.

New interest is given the question of electric smelting by reports that it has been proven a commercial success in Sweden. Canada, rich in iron ore and water power, should be an ideal country for the development of this new process.

Up to the present, Canada has depended largely upon the United States for her supply of iron. The coal fields, the ore deposits and the large centres of population are located in such an advantageous situation in that country as to make rapid development possible.

Some years ago the Canadian Government sent a Commission to Europe to investigate and report. Dr. Haanel's report stated clearly that it was possible to produce pig iron by electric smelting, but that the Canadian iron ores might require special treatment. A second Commission was appointed, this time to make experiments at Sault Ste. Marie. These experiments definitely proved that ores which were worthless for reduction in the blast furnace, because of their sulphur contents, could be successfully treated in an electric furnace.

A third Commission was named, and Dr. Haanel was sent to Europe a second time. On this trip he examined the experiments carried on by a number of young Swedish engineers, who have spent three years of time and almost \$200,000 in an endeavor to prove that the electric furnace was not only correct scientifically, but also possible commercially. They have solved the difficulties that confronted Canadian iron workers and company managers, and it is to be expected that very shortly Canadian ore will be electrically smelted in Canadian furnaces. The iron industry is but in its infancy in Canada. These new discoveries will lead to quick and sure growth, and with it will develop many kindred and dependent interests.

### THE RAILWAY LEVEL CROSSING.

The elimination of the grade crossing is no new subject. As an engineering problem it is not difficult of solution. As a matter of policy and of politics it is just as contentious as the two-cent passenger rate. The railways are quite willing to see grade crossings abolished—but who is to pay? At the present time, for every grade crossing that is being removed in Canada, thirty new grade crossings are being put in. This, then, is the place to start.

The construction departments of our railways have avoided the expense of subways or overhead bridges, but let it once be established that the final location must provide for the elimination of grade crossings on certain roads, and many of the excuses advanced on behalf of level crossings would at once disappear. Knowing that certain results had to be attained, slight changes in alignment and grade lines would make easy that which otherwise would appear impossible.

For a number of years the law has required a clearance of twenty-two and a half feet for all overhead bridges. This regulation has been one great factor in preventing the elimination of many grade crossings. This clearance may have been necessary in the days of hand-brakes, when it was necessary for train men to be on top of the freight cars, but to-day, with the universal adoption of the airbrake, it is not necessary. The clauses

in the rule books of our railways relative to "decorating" passing through station yards, etc., might well be modified. With changed conditions and new regulations it should be easy to secure a modification of the regulation with reference to clearance. A lessening of this clearance distance by a few feet would lessen the cost of many overhead bridges, and thus make possible the removal of a large number of grade crossings.

The great question is, "Who must stand the expense?" Clearly, the railways must not be expected to stand all the expense of correcting past errors. Rapid transportation is the result of a public demand—the public should stand a large share of the expense in making rapid transportation safe. Although a railway trades on what it is able to secure from the public rather than what it may give the public, yet to earmark any abnormally large per centage of railway revenue for grade crossing elimination would simply mean a lessening of service in some department.

To replace all the grade crossings at once would be out of the question. To postpone the work indefinitely would be criminal. Arrangements should be made whereby the Dominion, the municipalities and the railways would each pay a proportion of the cost of the removal of level crossings, and an Act should be passed regulating the increase of grade crossings.

EDITORIAL NOTES.

Winnipeg is to have another skyscraper. The G.T.P. Railway are preparing to erect a twelve-storey office building. With the Western offices of the C.P.R., C.N.R. and G.T.P., Winnipeg has a long lead as the Western railway centre.

\* \* \* \*

In the six years, 1902 to 1908, there was an increase in the equipment of the C.P.R. of 659 locomotives, 842 sleeping cars and day coaches, and 25,190 freight cars at an approximate cost of \$37,000,000. This is equivalent to one locomotive every three working days, one passenger car every two days, and fourteen freight cars each day during the entire period of six years.

PRECIPITATION FOR JANUARY 1909.

The precipitation was less than average over the greater portion of Canada, but in the St. Lawrence Valley and in New Brunswick it was somewhat in excess. The most marked feature, however, was the unusual snowfall in British Columbia where even near the coast there was sleighing on several days and the higher levels were soon thickly covered. At the close of the month in the Western Provinces the depth varied from a trace in Southern Alberta to 8 inches at Edmonton, 14 at Prince Albert, and about 6 inches over most of Manitoba. Ontario was snow covered, the depth ranging from about 2 inches in the south to 27 inches in the Ottawa Valley, and 21 inches in New Ontario. Quebec and Northern New Brunswick were buried under a depth of from 20 to 48 inches of snow, while the Maritime Provinces showed a white mantle varying from 5 to 28 inches in depth.

Thickness of Ice.

Thickness of ice as reported from various stations is as follows:

Western Provinces.—Edmonton, 22 inches; Medicine Hat, 24 inches; Swift Current, 30 inches; Qu'Appelle, 24 inches; Minnedosa, 27.5 inches.

Ontario.—Port Arthur, 14 inches; White River, 14 inches; Bruce Mines, 16 inches; Gravenhurst, 18 inches; Clinton, 4 inches; Strathroy, 10 inches; Port Burwell, 9 inches; Georgetown, 14 inches; Kingston, 7.5 inches; Lansdowne, 9 inches; Renfrew, 12 inches; Ottawa, 24 inches.

Maritime Provinces.—Chatham, 16 inches; Yarmouth, 8 inches; Sydney, 16 inches; Charlottetown, 12 inches.

The table shows for fifteen stations included in the report of the Meteorological Office, Toronto, the total precipitation of these stations for the month.

Ten inches of snow is calculated as being the equivalent of one inch of rain.

Station.	Depth in inches.	Departure from the average of twenty years.
Calgary, Alta. . . . .	0.70	+0.22
Edmonton, Alta. . . . .	0.50	—0.22
Swift Current, Sask. . . . .	0.50	—0.14
Winnipeg, Man. . . . .	0.70	—0.13
Port Stanley, Ont. . . . .	2.70	—0.30
Toronto, Ont. . . . .	2.45	—0.31
Parry Sound, Ont. . . . .	2.60	—1.36
Ottawa, Ont. . . . .	3.30	+0.28
Kingston, Ont. . . . .	2.30	—1.84
Montreal, Que. . . . .	4.70	+1.01
Quebec, Que. . . . .	5.00	+1.10
Chatham, N. B. . . . .	4.70	+1.10
Halifax, N. S. . . . .	5.20	—0.56
Victoria, B. C. . . . .	3.20	—1.42
Kamloops, B. C. . . . .	0.80	—0.20

COMING MEETINGS OF ENGINEERING SOCIETIES.

**Association of Ontario Land Surveyors.**—February 23, 24, 25, 1909, Annual Meeting, Parliament Buildings, Toronto to Killaly Gamble, secretary-treasurer, 703 Temple Building, Toronto.

**Canadian Cement and Concrete Association.**—First Annual Convention and Exhibition, March 1-6, 1909, St. Lawrence Arena, Toronto. Secretary, A. E. Uren, 62 Church Street, Toronto. Manager of Exhibition, R. M. Jaffray, 1 Wellington Street West, Toronto.

**Canadian Mining Institute.**—March 3-5, 1909, annual general meeting, Windsor Hotel, Montreal. H. Mortimer-Lamb, secretary, Montreal.

**Dominion Land Surveyors.**—February 23, 24, 25, 1909, annual meeting, Ottawa, Ont. T. Nash secretary.

**Northwestern Cement Products Association.**—March 2-4, 1909, fifth annual convention, Minneapolis National Guard Armoury, Minneapolis, Minn.

**Ontario Provincial Good Roads Association.**—March 3, 4, 1909, Annual Meeting, County of York Municipal Hall, Adelaide Street, Toronto. J. E. Farewell, Secretary, Whitby, Ont.

**Providence Association of Mechanical Engineers.**—June 22, 1909, Annual Meeting. Secretary, T. M. Phetteplace.

RAILWAY EARNINGS AND STOCK QUOTATIONS

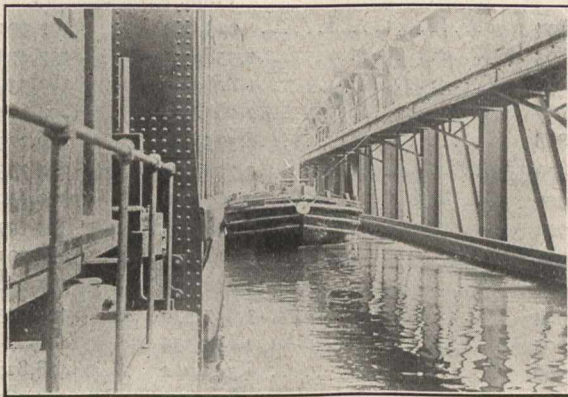
NAME OF COMPANY	Mileage Operated	Capital in Thousands	Par Value	EARNINGS		STOCK QUOTATIONS								
				Week ending Feb. 4		TORONTO				MONTREAL				
				1909	1908	Price Feb 6 '08	Price Jan 28 '09	Price Feb. 4 '09	Sales Week End'd Feb 4	Price Feb 6 '08	Price Jan. 28 '09	Price Feb. 4 '09	Sales Week End'd Feb 4	
Canadian Pacific Railway . . . . .	8,920.6	\$150,000	\$100	1,185,000	89,700	151 150	172½	173½	380	150½ 150	173½ 173	173½ 173½	352	
Canadian Northern Railway . . . . .	2,986.9			119,800	119,200									
*Grand Trunk Railway . . . . .	3,568.7	226,000	100	603,500	448,543									
T. & N. O. . . . .	305	(Gov. Road)		20,500	8,000									
Montreal Street Railway . . . . .	138.3	18,000	100	67,876	61,071					161 180	207 206 207½	206½	122	
Toronto Street Railway . . . . .	114	8,000	100	67,053	59,242		113		120	1279	99½ 99	112½ 120½	120	5849
Winnipeg Electric . . . . .	70	6,000	100			140 136	159 157	168	585		158½ 156½	170 160	75	

\* G.T.R. stock is not listed on Canadian Exchanges. In London, 1st pref. is quoted at 101½, 3rd pref. at 56 and ordinary at 19.

**MANCHESTER SHIP CANAL.**

**R. Dawson Harling.\***

Whilst giving a general account of the history, construction and working of the Manchester Ship Canal, which directly connects the inland city of Manchester with the sea, and thus opens up direct communication between that port and every other seaport in the world, the lecturer directed special attention to the engineering difficulties which had been met with during construction, and overcome by the very able band of engineers, headed by Mr. (now Sir) E. Leader Williams, who now occupies the position of Consulting Engineer to the Company, and his assistant, Mr. W. Henry Hunter,



**Barton Aqueduct, Carrying Bridgewater Canal Over the Ship Canal.**

now Chief Engineer of the company. Mr. Hunter is well-known on this side through his connection with the Panama Canal, as a member of President Roosevelt's International Commission of Engineers to advise on the "modus operandi" to be followed in the construction of the Panama Canal.

For the purposes of this lecture Mr. Hunter had sent over various pamphlets and lantern slides which were of great assistance to the lecturer, as a layman, in explaining the details of the various works.

This Ship Canal is entered from the River Mersey about six miles above Liverpool. It is 35½ miles in length, and as originally constructed, had a depth of 26 feet. The depth has recently been increased to 28 feet. The bottom width at full depth is 120 feet, except at the locks, and also at the docks at Manchester, where the width is increased, in the latter place considerably. The locks are five in number, the dimensions being as follows:—

	Small.	Intermediate.	Large.	Rise.
Eastham	.....150 by 30 ft.	350 x 50'	600 x 80'	.. 6"
Latchford	.....	350 x 45'	600 x 65'	14' 6"
Irlam	.....	350 x 45'	600 x 65'	16' 0"
Barton	.....	350 x 45'	600 x 65'	15' 0"
Mode Wheel (Manchester)	....	350 x 45'	600 x 65'	13' 0"

From the illustration it will be seen that the construction of these locks is of a most durable character, the materials used being granite and concrete. From the Eastham locks at the opening to the river to the next set of locks at Latchford, twenty-one miles, the level of the water is affected by the tides in the Mersey, a minimum depth of 28 feet being preserved by the operation of the lock gates. Above the locks at Latchford a constant depth is maintained by means of sluice gates.

The construction of the lock gates was particularly described and illustrated by plans and elevation. The material used is Demerara Greenheart, grown only in the forests of British Guiana and adjacent territory. From long experience this wood has proved its superiority for lock gates over any other hardwood, and is more adaptable for this purpose than steel. In the course of the Ship Canal there are over fifty pairs in use, each leaf of which weighs about 100 tons.

\*Abstract of an address given by Mr. Harling before the Engineers' Club, Toronto.

They are worked by hydraulic machinery built into the lock walls.

Across the path of the Ship Canal there have been constructed seven fixed bridges, five being railway and two road, each bridge having a clear headway of 75 feet from the normal water level to the underside of the girders.

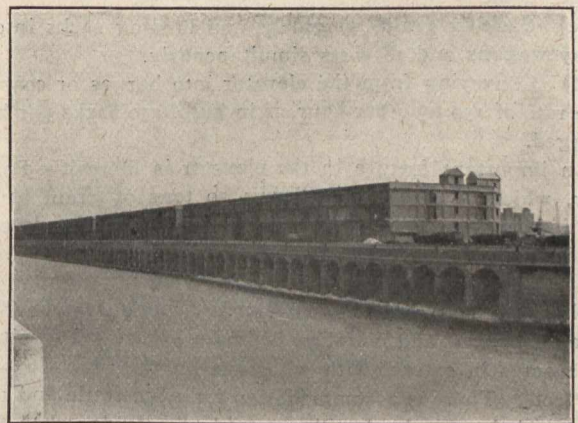
When the Bridgewater Canal (now a part of the Manchester Ship Canal undertaking) was constructed, about two hundred years ago, the famous Engineer Brindley constructed an equeduct to carry the water of the canal over the River Irwell. The bed of the Irwell is now the bed of the Ship Canal, and in place of Brindley's aqueduct a triumph of engineering skill was consummated in the construction of the famous Barton Aqueduct, as shown in the accompanying views. It consists of a steel caisson mounted on a pier in the middle of the Ship Canal, which was widened for that purpose, with steel gates both at the land and equeduct ends for the impounding of the water. Its length is 235 feet, depth 6 feet, width 18 feet, span 90 feet, and weight of swinging span 1,450 gross tons.

The area of the Manchester Dock Estate is 406½ acres, including the water area of 120 acres. The quays (or wharves) are 6½ miles in length and 286½ acres in extent.

There are nine docks, five of which are used for light draft vessels trading to and from British and continental ports, and four for ocean vessels of a capacity up to 12,000 tons dead weight. Dock No. 9 was constructed on part of the site formerly occupied by the Manchester Race Course, and was opened by His Majesty, King Edward the Seventh, in July, 1905. It is 2,700 feet long, 250 feet wide, and 28 feet deep. The peculiarity about the construction of this dock is seen in the appearance of the walls. Usually these are solid and in such docks much damage is done to steamers moored against the quays by ranging, caused by the movement of other craft to and from their berths. By means of the concave arches, as seen in the illustration, practically all this is avoided, and steamers can move about at any rate of speed without disturbing the vessels moored to any appreciable degree.

Another important feature is the fine range of sheds on the south side of this dock. There are five in number, four of them being 425 feet long, and one 450 feet long; each is 129.5 feet wide, and connected with the others by covered passage ways.

There is a ground floor, two intermediate floors, with a flat roof upon which cargo may be stored. These have been



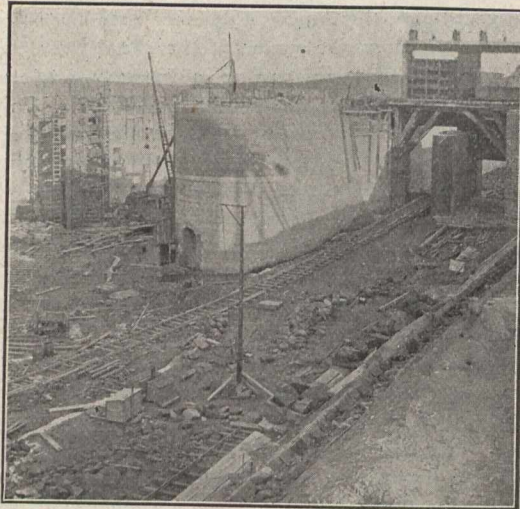
**New Dock, No. 9, Before Admission of Water, Showing Arches, and Concrete Sheds.**

built on the Hennebique system, the chief materials in the construction being ferro-concrete, iron and steel.

The equipment of these docks consists of 53 hydraulic, 65 steam, and 91 electric cranes, most of them moveable on rails with a radius of 16 to 40 feet, capable of lifting from one to 10 tons to a height from rail level of from 13 to 59 feet; a 30-ton steam crane; 47 locomotives, and 1,400 railway wagons; six floating pontoons of a dead-weight capacity of 800 tons each, and all modern appliances for giving vessels quick despatch.

There is also a pontoon sheers capable of dealing with weights up to 250 tons, with a lift of 21 feet.

There is a range of thirteen single floor, one two-floor, six three-floor, five four-floor, and twelve five-floor transit sheds, fitted with the most modern appliances, including a cold transit shed, for the sorting of frozen meat and other perishable produce; also thirteen warehouses, seven storeys



Eastham Locks Before Admission of Water.

each, with 27 friction hoists worked by gas engine; and in Trafford Park adjoining the docks, the Ship Canal Company have four single-floor warehouses, each 300 feet by 100 feet. The docks, quays, sheds and warehouses are lighted by electricity, and there are 30 hydraulic and 16 electric capstans on the quays.

The Port of Manchester is noted from the fact that it has had built a grain elevator,  $1\frac{1}{2}$  million bushels' capacity, the first one to be built in Great Britain on the American plan. It is divided into 268 separate bins. The following operations can be performed simultaneously:—

(a) Discharging from vessels in the docks at the rate of 350 tons per hour.

(b) Weighing in the tower at the water's edge.

(c) Conveying to the house and distributing into any of the 268 bins.

(d) Moving grain about within the house for changing bins or for delivery, and weighing in bulk at the rate of 500 tons per hour.

(e) Sacking grain, weighing, and loading sacks into 40 railway wagons and 18 carts simultaneously.

(f) Conveying from the elevator into barges or coasters at the rate of 150 tons per hour, if in bulk, 250 sacks per hour if bagged.

An important feature in the elevator is Metcalf's Patent Dryer, which is capable of drying 50 tons of grain at one operation, and grain can be moved to and from the dryer to any bin in the house. The foundations of a similar elevator have been laid at the east end of No. 9 dock.

Near the last set of locks (Mode Wheel) are the Manchester Lairages and Foreign Animals Wharf. The site is twelve acres in extent, with wharfage on the Ship Canal of 8,000 feet. There is accommodation for 1,850 cattle and 1,500 sheep, and there is land still reserved to provide, when fully utilized, a total accommodation of 3,000 cattle and 3,000 sheep. The equipment consists of the most up-to-date appliances for feeding, slaughtering, chilling and distributing. All the steamers sailing from the North Atlantic ports to Manchester carry loads of cattle from 270 to 684 each.

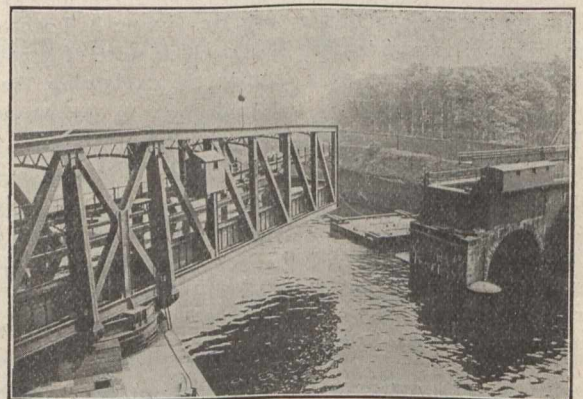
Regular lines of steamers trade direct from Montreal and Quebec, (in summer weekly), St. John, N.B., and Halifax, N.S., (in winter fortnightly), Boston, New York, and Philadelphia, (each fortnightly). During the cotton season regular lines run from Galveston, New Orleans, Pensacola, Savannah and Brunswick.

A very large trade is done direct with British, European, Asiatic and Australasian ports.

To finance this undertaking an enormous capital was necessary, amounting to over 92 million dollars. Very great progress has been made towards the financial success of the concern, although it will be several years before any dividend can be paid to shareholders. At the close of 1907 all the costs of operating had been paid, together with interest on loans and debentures. Everything looked bright for the payment of at least a small dividend in this present year or next. The universal trade depression of 1908, however, has postponed this long-looked for event for the present. The Ship Canal was opened for traffic 1st January, 1894, and for fourteen years the traffic and revenue increased gradually, as will be seen from the following table:—

	Tons.	£.
1894	925,659	97,901
1895	1,358,875	137,474
1896	1,826,237	182,330
1897	2,065,815	204,664
1898	2,595,585	236,225
1899	2,778,108	264,775
1900	3,060,516	290,830
1901	2,942,393	309,517
1902	3,418,059	358,491
1903	3,846,895	397,026
1904	3,917,578	418,043
1905	4,253,354	449,436
1906	4,700,924	498,837
1907	5,210,759	535,585

The commercial success, however, is indisputable. The city of Manchester and other towns in the vicinity have all felt the advantages that the operation of the Ship Canal has brought with it. The depression that clung to trade in this district year after year during the 'seventies and 'eighties to such a degree that the merchant and manufacturer were inclined to cry "Ichabod," has been removed, and prosperity



Barton Aqueduct, Open to Allow Vessel in Ship Canal to Pass.

has spread her wings abroad, owing largely to the presence of this Great Waterway. Even the shareholder in very many cases has received indirectly very handsome dividends from the commercial success of the Manchester Ship Canal.

## PATENTS.

The following is a list of Canadian patents recently obtained through the agency of Messrs. Ridout & Maybee, 103 Bay St., Toronto, from whom further particulars may be obtained.

Pedro Zerbino, automatic gate; G. Angelini, microphones; I. P. Doolittle, stamp and ticket holder; J. R. Mallyon, apparatus for turning leaves of books; J. E. Duncan, insulator; J. E. Duncan, cable hanger; F. H. Pierpont, cutter grinding machine; Turnbull & Goding, steam generator; H. W. Garratt, locomotive; J. Bowey, Jr., suction gas producer; Rollin N. Calkins, extracting volatilizable products from wood; Rollin N. Calkins, steam retort; Rollin N. Calkins, fire retorts; John Muir, agitator for concrete mixer; Wm. J. Graham, junction box.

## THE RAILWAY CROSSING.

### Its Development and Proposed Elimination.

F. L. Somerville, M.C. Soc. C.E.

The grade crossing question has been much in evidence lately and has been a subject of grave consideration by the people of the United States for some time.

Every time one opens a paper and reads of another grade crossing accident one realizes that the time has come when the public, to insure its safety, must take the matter up and deal with the whole subject in a businesslike manner.

The present conditions leave much to be desired. Speaking generally the steam railways, even in large cities, adhere closely to the natural surface of the ground and cross the streets at grade. Consequently a stranger may, at times, be puzzled to know whether he is standing on a street car line or on the tracks of the Grand Trunk, the Canadian Pacific or the Canadian Northern Railways and only awakens to his position upon hearing the monotonous death bell or screech of a steam vitalized monolith. Railroads, street car tracks and public roadways cross and recross one another not only to the danger of the public, as is constantly in evidence, but also at the expense of much loss of time and delay to both railroad and ordinary traffic, to say nothing of the loss of temper to the unfortunate individual who, having just one minute to catch a boat, say at the Yonge Street wharf, is compelled to watch an extended panorama of various designs of freight cars pass between him and the wished-for boat.

This condition of affairs is, however, the inevitable attendant of a young and rapidly growing country. No person or corporation is to blame in the matter. It has, however, become a matter of vital importance and must be altered. To do so will take time and money. It is a national question and must be so treated. It is not only a railway question but it is a people's question and both parties must approach it in a fair and unprejudiced spirit.

It is the purpose of this paper to briefly point out the conditions which have led up to the present difficulty, how far and by what means the question has been met up to the present time, and generally to point out a few of the engineering points which have to be considered in eliminating grade crossings under various topographical conditions.

#### The Evolution of the Grade Crossing.

The first settlements naturally were on the coast and on the banks of rivers navigable by sea-going vessels. As population and trade with the interior increased the rivers and lakes became the channels of transportation. By short roads or portages obstructions in the waterways were overcome, settlements were established along the waterways and on the shores of the lakes and to facilitate communication, roads more or less parallel to the waterways, were constructed, followed by roads which struck across country cutting off the detours caused by the windings of the streams and opening up the country lying back of the navigable waters. Then as settlement increased the land was laid out into farm lots in a more or less systematic manner and other roads were constructed which acted as feeders to the main roads.

Traffic increased but transportation by road remained slow, difficult and expensive and the waterways were called to assist by means of canals and locks and harbors were established at points, more or less suitable, on the banks of the rivers and lakes.

This was the condition of affairs when the railway made its appearance.

The advantages of steam railway transportation were soon appreciated and every inducement was held out to invite capital for railway construction.

The country, however, being sparsely settled and money difficult to raise it was a question of the cheapest possible kind of railway or no railway.

In the grading of the roadbed lay the greatest factor of practicing economy and consequently a grade line following as closely as possible the surface of the ground became the

standard of the continent. The result being that, in most cases, the railways crossed the roadways at grade.

#### The Danger of Grade Crossings.

At first railway traffic was light, trains were slow and infrequent and, except in the larger towns and villages traffic on the roadways was also light. The people were anxious for railways and were willing to run whatever risk might arise from the mixture of traffic on the crossings.

The advent of the railway was followed by an increase in the rural population and a consequent increase in that of the existing towns. New towns were established, manufacturing encouraged, and new manufactories started. Existing railways were rapidly extended and new railways built thus opening lands for settlement.

The result of this growth with the consequent increase in traffic made the existence of the grade crossing a source of danger, increasing in proportion to the amount of traffic on the railway and of travel on the highway.

In course of time the railways found it necessary to build additional tracks on which to handle the increased traffic. In some cases, such as the Pennsylvania Railway, the New York Central and Hudson River Railway, and the New York, New Haven and Hartford Railway, it has been found necessary to provide four tracks to properly handle the traffic.

#### Protection of Grade Crossings.

As traffic and tracks increased so the danger of crossings at grade increased, and various attempts were made to minimize the danger; automatic bell signals (not always reliable) were installed, watchmen (generally worn out servants of the railway companies) were placed at the crossings to warn the public. At the more dangerous crossings watchmen were put in charge of gates; where electric roads crossed the steam railways, derails have been installed which, however, have not always served the desired purpose.

The above methods of protection proved only partially successful, accidents still happened, people, in spite of warning of bell, watchman or gate were killed or injured. Both the highway and, in many cases, the railway traffic was delayed, train speed was reduced by statute or otherwise seriously interfering with the working of the system.

#### Legal Measures Taken in Massachusetts.

In 1873 the State of Massachusetts appointed a commission to deal with the question of minimizing the danger of grade crossings.

The general law provided that no new railroad track should cross any existing public highway at grade and no new public highway should cross any existing railroad at grade without the consent of the board. While the board endeavoured to restrict grade crossings it sometimes, under pressure of local interests, or on account of cost departed from its general policy by permitting grade crossings and in many cases such crossings were authorized by direct action of the legislature.

In 1873 the board secured the passage of a law whereby municipalities and railway companies might agree to separation of grades, the cost being apportioned by a commission appointed by the Supreme Court.

The number of grade crossings abolished under this law hardly kept pace with the new ones established.

Subsequently the board was authorized to order gates or flagmen. In spite of this, however, accidents occurred and the board continued to advocate, and the public demand, the abolition of the more dangerous crossings.

After several enquiries and reports the legislature in 1890 passed a law which, in brief, provided

That the railway or the municipal authority have power to petition the Supreme Court to appoint a special commission to deal with the questions of:

- (a) Abolition of grade crossings.
- (b) Methods of separation of grades.
- (c) By whom the work should be executed.

As to cost it was provided that 65 per cent. be paid by the railway company, not more than 10 per cent. by the municipality, and the balance by the State, the latter contribution being limited to \$500,000 a year for ten years.

The original law provided that the railway grade should not be changed without the consent of the directors of the railway company. This being considered an obstacle to certain desirable reforms the board of railway commissioners, as a disinterested party, was substituted in lieu of the directors.

The law provides for the abolition of grade crossings by agreement between municipalities and railway companies if approved by the board, 20 per cent. of the cost to be borne by the state and the balance by the parties according to agreement.

#### Action of Other States.

Other States have followed the example of Massachusetts by placing part of the cost of the elimination of grade crossings on the public, but some have forced the railways to bear the whole cost without any public contribution whatever.

In most cases the municipalities have been compelled to take the initiative in negotiations. In the neighborhood of large cities, however, or under circumstances of heavy, frequent and fast traffic the railways have often taken the initiative.

The Pennsylvania Railroad, while invariably avoiding grade crossings on new work, has in the last six years been eliminating many old grade crossings. On January 1st, 1902, on the lines of heaviest traffic between New York and Washington and between Philadelphia and Pittsburg there were 994 grade crossings, while up to January 1st, 1908, 568, or more than 50 per cent., were abolished.

The completion of the new Washington terminals marks the consummation of the plans of the late President Cossatt, viz., to eliminate all grade crossings in the important cities between New York and Washington. This has involved the elevation or depression of tracks in Jersey City, Newark, Elizabeth, New Brunswick, Trenton, Philadelphia, Chester, Wilmington, Baltimore and Washington.

Of the 101 grade crossings between Altoona and Harrisburg on January 1st, 1902, only 51 remained on January 1st, 1908, another 50 per cent. reduction.

#### Elimination of Grade Crossings.

No fixed method can be established for the elimination of grade crossings. Each requires individual consideration.

The main considerations are:

- (a) The topographical environments.
- (b) The railway grades.
- (c) The highway grades.
- (d) The nature and value of the buildings in the vicinity.
- (e) The character of the railway traffic.
- (f) The character of the highway traffic.

The various methods may be classified.

- 1st. Elevation of track without interference with highway.
- 2nd. Depression of track without interference with highway.
- 3rd. Elevation of highway without interference with track.
- 4th. Depression of highway without interference with track.
- 5th. A combination of the 1st and 4th.
- 6th. A combination of the 2nd and 3rd.

In thinly populated districts or where property is not of great value, grade crossings may often be eliminated by consolidating two or more roadways into one and conveying it under the tracks by a subway or over by a bridge as may be suitable.

A point to be considered, more particularly in Canada, where the law calls for a clearance over the highway of fourteen feet and over the tracks of twenty-two feet six inches, is that less disturbance of existing grades is caused by carrying the tracks over roadways than by carrying roadways over tracks.

In 1892 on the question of the elimination of grade crossings in the city of Buffalo, Messrs. E. L. Corthell and A. W. Locke report:

"Where sidings are not too numerous it will sometimes be found to be cheapest to raise or lower the tracks rather than to confine the change altogether to the streets. In cities the latter plan is apt to entail large expense for dam-

ages done to adjoining estates, while as a general thing, damages for changes in the grade of the railroad cannot be recovered by adjoining owners."

In towns where the natural surface of the ground is fairly level, where good drainage cannot be easily obtained, and where the highway crossings are not far apart it will be found cheaper to elevate the tracks, making an easy gradient at each end of the elevation. This method is applied at Chicago, on the old Colony road and the New Haven road in Boston, at Bridgeport, etc.

In valley towns where the railways descend by grades more or less steep from either side and where the towns have spread out onto the highground with grade crossings throughout, the best method may be to elevate the tracks on the low ground and depress them on the high ground thus improving the railway grades and, at the same time, abolishing the grade crossings. A good example of this method is the D. L. and W. Railway in Newark, N.J., where 26 grade crossings were changed into four undercrossings and twenty-two overhead crossings by the highways and the railway grade was reduced from 3 per cent. to 1.15 per cent.

Where towns are on high ground and good drainage can be obtained it may be better to depress the tracks thus decreasing the total rise and fall of the railway.

Where the tracks run alongside of or at the foot of a hill consideration is necessary before deciding whether the tracks or the roadways should be elevated. If the streets leading from the highground to the tracks are steep and the land beyond the tracks is sparsely occupied it may be possible to carry the roadway over the tracks with little interference or damage to the property adjoining the roadway. Before coming to a decision, however, calculation should be made of the value of such interference or damage, if any, to which should be added the cost of building the bridges and approaches and the total thus found should be compared with the cost of elevating the tracks with any damages that may be incidental thereto. If drainage can be obtained it may be possible to partially depress the tracks or the roadways, but if this is done the cost of interference with underground pipes must be considered.

Where the tracks run along the bottom of a narrow valley it is obvious that overhead bridges are eminently suitable where the necessary clearance can be obtained. By adopting this method the grades of the roadways will be improved.

#### Incidental Injury.

All such grade alterations cause more or less injury to adjoining property. If the roadway levels are changed access to such properties will be interfered with. If the roadways or tracks are depressed there may be trouble with underground pipes or conduits. If the elevation of the tracks is changed sidings leading to factories will be affected, but in most cases this can be remedied by using short steep grades as has been done at Philadelphia, where grades of 5 per cent. are used on sidings leading from the depressed tracks to the Baldwin locomotive works and other industries. Where the tracks are elevated it may often be advantageous to maintain the sidings at the level of the elevated tracks, especially where the inward shipments can be dumped from the cars.

#### The Situation in Canada.

While some grade crossings in Canada have been eliminated this has generally been incidental to grade improvement of the railways as, for instance, at Brantford and Paris and on the line between those towns.

Up to the present time few systematic attempts have been made to deal with the subject, the only ones known to the writer being the proposals of the Grand Trunk Railway to eliminate grade crossings in Montreal and in London, neither of which have yet been carried out on account of non-agreement between the cities and the railway.

#### The Toronto Scheme.

The attempt recently made to solve the problem so far as the tracks along the waterfront in Toronto are concerned is without doubt the most important step that has yet been taken in Canada, and as the Railway Commission has given its decision on part of the scheme it may be interesting to

describe the proposal at some length and to give the reasons which lead the writer and the other engineers associated with him in advising the city, to recommend the elevation of the tracks on that portion of the scheme on which they were consulted.

On the westerly side of Toronto the city is approached by—

1st. A line from the north (from Barrie and North Bay), owned by the Grand Trunk Railway.

2nd. Lines running parallel from the northwest (from West Toronto) and owned by the G.T.R. and C.P.R.

3rd. A line from the west (from Mimico and Hamilton), owned by the G.T.R. and used jointly by the G.T.R. and C.P.R.

Of these the first two approach each other near Dundas Street and from there run parallel to Bathurst Street, where they are joined by the third line and from which point they run over common tracks to the Union Station.

As lines Nos. 1 and 2 are on a long steep gradient it would be impracticable to change their grades, but a start has been made to solve the problem of grade separation by carrying Dundas Street over all the tracks and by building subways at Lansdowne Avenue and at Queen and King Streets, leaving, between Dundas and Bathurst Streets, only two grade crossings: at Brock and Strachan Avenues.

On line No. 3 the track descends on a steep grade from Mimico to the Humber River, where it is only a few feet above the level of the lake. From the Humber it runs level along the lake shore to Sunnyside, from which point it rises rapidly to the high ground at Dufferin Street, from whence it falls to nearly the lake level at Bathurst Street, where it joins lines Nos. 1 and 2. From Bathurst Street it runs level to the Don River, from whence it rises rapidly to East Toronto and Scarborough.

A short distance west of the Don the C.P.R. and the C.N.R. diverge from the last described line and run in a northerly direction along the westerly bank of the river.

From the Humber to Bathurst Street all the crossings, except Strachan Avenue, which crosses the tracks by an overhead bridge, are grade crossings. Bathurst Street crosses by means of an overhead bridge leading from the high ground on the north to the "Old Fort." At Spadina Avenue a bridge carries the roadway over some G.T.R. freight tracks which lie immediately below the northerly bluff, but the main lines are crossed at grade. At John and York Streets the roadway are carried across all tracks by bridges and from York Street to the Don River the tracks run for the greater part of the distance along the southerly side of Esplanade Street, and all streets cross at grade.

From the Don River to East Toronto all streets cross at grade except Gerrard Street, which passes under the tracks and Main Street in East Toronto, which passes overhead.

On the westerly bank of the Don River the C.P.R. and the C.N.R. (which latter railway runs over the G.T.R. Belt Line) cross all streets at grade except at Gerrard Street, where a high level bridge, spanning the valley, carries the roadway over the tracks and the river.

The lines above described divide themselves into the following sections:

- 1st. The portion from the Humber to Bathurst Street.
- 2nd. From Bathurst Street to the Don.
- 3rd. From the Don to East Toronto.
- 4th. Along the valley of the Don.

As regards section No. 1 it is proposed to elevate the tracks between the Humber and Sunnyside passing over the roadways, and to depress them between Sunnyside and Bathurst Street, passing under the roadways. All parties are agreed that this is the proper way to treat this section, but the matter becomes somewhat complicated on account of the work lying in two, if not three municipalities, and on account of the proposal to close certain of the crossings. A final solution has not yet been reached, but the question is to come before the Railway Commission in March next.

Section No. 2 has for some time past been the subject of much controversy, and was only settled a short time ago by the Railway Commission, after a lengthy hearing, deciding

in favor of elevated tracks, and ordering the railway companies to prepare plans for its approval.

The danger of the grade crossings on the waterfront, more particularly at Bay and Yonge Streets, where, during the summer months, large crowds cross the tracks in going to and from the boats, has long been recognized, but no systematic attempt was made to deal with the problem until the railways applied to the Railway Commission for approval of the plans of the proposed new passenger station near the lower end of Bay Street.

It was at once seen that, if a new station were built, it would prevent, for many years to come, any change in the level of the tracks and would confine the solution of the crossing question to the adoption of overhead bridges.

The Toronto Board of Trade took the matter up and after much consideration and under the advice of Mr. J. W. Moyes, of Toronto, and of the late Mr. R. H. Berrian, C.E., prepared a plan showing a scheme of partial elevation, whereby the main lines were to be elevated, but local freight tracks were left on the street level.

This plan did not, in the opinion of the City Council, go far enough as it was its wish, that all tracks should be removed from the street level, especially at the more busy crossings.

City Engineer C. H. Rust called in, in consultation, Mr. W. F. Lye, C.E., of Montreal, M. R. Isham Randolph, C.E., of Chicago, and the writer, and a plan was finally drawn up and submitted to the Commission which removed all tracks from the streets between Bathurst and Cherry Streets, and also between the Don and Pape Avenue.

Before finally deciding on a plan the question was considered from every point of view and the proposition to cross the tracks by several overhead bridges was carefully examined.

It was found that between Yonge and Parliament Streets there are twenty-nine public and private crossings that the approaches to the bridges would extend into the waters of the bay, that the approaches on the north side would interfere seriously with existing buildings, that the grades of the approaches would reduce the loads or require additional horses to haul them over the bridges, that the closing of the existing crossings would necessitate a much increased length of haul to and from property lying south of the tracks, and that while the cost of building the bridges might be comparatively light the damages incidental to building them and their approaches and to closing the existing crossings would be very heavy.

Fortunately reliance had not to be placed on theory only as the existence of the York Street bridge, where additional horses have constantly to be kept to assist teams going to and from the C.P.R. freight yard, gave an illustration of the increased cost of hauling loads over such a bridge, and in giving evidence before the Commission Mr. Elias Rogers, of the Elias Rogers Coal Company, estimated that if overhead bridges were built and their existing crossing closed it would be necessary for that company to provide one hundred additional horses during the busy season.

On the other hand it was recognized that, if the scheme of elevated tracks were adopted, the railways would be seriously inconvenienced while the work was in progress, that it might be necessary to make many changes in the methods of handling freight, more particularly in the C.P.R. yard at the foot of York Street, and on the unloading tracks along Esplanade Street, and that considerable changes would have to be made in industrial establishment which are now served by private sidings.

A comparison of the disadvantages as above described showed to the satisfaction of the city's engineers that the balance was in favor of elevated tracks.

A great advantage that was common to both schemes, when completed, was the absolute separation of roadway and railway traffic, thus relieving the roadway traffic from annoying delays and permitting the railways to run at speed without fear of collision between the two classes of traffic. It was, however, seen that, while there was little to choose between the two schemes so far as increased safety in handling

trains was concerned, there was a marked advantage, so far as the roadway traffic was concerned, in the track elevation as the traffic between the water and the city could pass unobstructed over the existing roads, using the present grades without having to be raised to the height that would be necessitated by overhead bridges.

Acting on these views certain plans were prepared showing all the tracks along the waterfront elevated, which plans were submitted to the Railway Commission, not as a final solution of the problem, but as a suggestion showing that the elevation of the tracks was practicable.

After a lengthy hearing, during which many details were discussed, but which it is not necessary to enter upon here, the Railway Commission gave a decision in favor of elevation of the main lines, leaving the freight tracks east of Church Street on the surface but limiting the movement of cars on them to certain hours at night, and instructing the railways to submit complete plans for their approval within three months from the date of the order.

On section No. 3 a slight elevation of the tracks east of the Don will permit of subways at Eastern Avenue and Queen Street, and the topography lends itself to the construction of subways at most of the other crossings, but, in the writers opinion, arrangements should be made for their construction before the adjoining property is built upon.

On section No. 4, where the tracks run along the valley of the Don, the high banks on either side emphasize the use of high level roadway bridges as being the best solution of the problem.

#### The Railway Commission.

In the opinion of the writer Canada is fortunate in having one board of commissioners for the whole Dominion—as this tends to uniformity of practice and the Commission is free from local or sectional influences. From his experience, which dates from the inauguration of the board, the writer is satisfied that the members of the Board try to hold the balance fairly and honorably between the public and the railways. Their powers are greater than those of most of the boards in the United States, and they have the power of apportioning the cost of such improvements as have been suggested in this paper between the municipalities and the railway companies.

#### Apportionment of Cost.

In the earlier portion of this paper it was shown that grade crossings have become acutely dangerous by reason of the increased traffic on the railways and the increased population of the country which would, to a large extent, have been impossible without the assistance of the railways, and there are strong arguments in favor of the public in cities and towns bearing a portion of the cost. However, there are many crossings in the rural districts which were comparatively safe when the railways had but one track with infrequent train service which have been rendered dangerous by the increased quantity and speed of the railway traffic and the multiplication of tracks. On many such crossings the highway traffic has remained nearly stationary, and on some, by reason of the construction of the railways, it has decreased. In such cases, it appears to the writer that, as the increased danger has been caused wholly by the railway, it would be unfair to make the users of the highway bear any portion of the cost of the increased protection.

In the urban districts and on main lines of heavy and fast traffic the grade crossing question is a serious one—the public demands and the railways are forced to run frequent and fast trains with the result that every grade crossing is a source of danger. Every accident is regretted by the officials of the railways, but no railway in Canada has the money, nor has it the means to raise the money to properly protect every crossing, and many of the municipalities are so situated financially that they can only contribute a small amount, if any, towards this object. In the United States where each State has separate jurisdiction many of them have large sums to promote increased safety, but in Canada, where nearly all the steam railways are under the jurisdiction of the Federal Government, the provincial authorities have so far done nothing.

Both the Federal and Provincial Governments are the guardians of the public interests, and it is the opinion of the writer that no new railway should be authorized in the more thickly settled districts unless all crossings are protected, and that on the older roads some course should be adopted whereby one or both Governments should contribute towards the expense of eliminating the unprotected crossing.

This is not beyond the powers of legislation, and the writer would suggest that each Government set aside a sum of money each year to be spent for this purpose, such sums to be apportioned as regards the contribution of the Federal Government by the Dominion Railway Commission and as regards the contribution of the Provincial Government by a board to be appointed by that Government.\*

In conclusion the writer appreciates that the limits of this paper have prevented him from touching upon many points that are worthy of much consideration, but he submits it in the hope that what he has said may throw some light on what has become a serious problem and may lead to systematic action being taken.

### ENGINEERING SOCIETIES.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS (TORONTO BRANCH).—W. H. Eisenbeis, Secretary, 1207 Traders Bank Building.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—29 West 39th Street, New York. President, H. L. Holman; Secretary, Calvin W. Rice.

ARCHITECTURAL INSTITUTE OF CANADA.—President, A. F. Dunlop, R.C.A., Montreal, Que.; Secretary, Alcide Chaussé, P.O. Box 259, Montreal, Que.

CANADIAN CEMENT AND CONCRETE ASSOCIATION.—President, Peter Gillespie, Toronto, Ont.; Vice-President, C. F. Pulfer, London, Ont.; Secretary-Treasurer, Alfred E. Uren, 62 Church Street, Toronto.

CANADIAN ELECTRICAL ASSOCIATION.—President, N. W. Ryerson, Niagara Falls; Secretary, T. S. Young, Canadian Electrical News, Toronto.

CANADIAN INDEPENDENT TELEPHONE ASSOCIATION.—President, J. F. Demers, M.D., Levis, Que.; Secretary, F. Page Wilson, Toronto.

CANADIAN MINING INSTITUTE.—Windsor Hotel, Montreal. President, W. G. Miller, Toronto; Secretary, H. Mortimer-Lamb, Montreal.

CANADIAN RAILWAY CLUB.—President, L. R. Johnson; Secretary, James Powell, P.O. Box 7, St. Lambert, near Montreal, P.Q.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, Geo. A. Mountain; Secretary, Prof. C. H. McLeod. Meetings will be held at Society Rooms each Thursday until May 1st, 1909.

QUEBEC BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—Chairman, L. A. Vallee; Secretary, Hugh O'Donnell, P.O. Box 115, Quebec. Meetings held twice a month at Room 40, City Hall.

TORONTO BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—96 King Street West, Toronto. Chairman, C. H. Mitchell; Secretary, T. C. Irving, Jr. Traders Bank Building.

MANITOBA BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—Chairman, H. N. Ruttan; Secretary, E. Brydone Jack. Meets first and third Friday of each month, October to April, in University of Manitoba.

CANADIAN STREET RAILWAY ASSOCIATION.—President, J. E. Hutcheson, Ottawa; Secretary, Acton Burrows, 157 Bay Street, Toronto.

CENTRAL RAILWAY AND ENGINEERING CLUB.—Toronto. President, C. A. Jeffers; Secretary, C. L. Worth.

DOMINION LAND SURVEYORS.—Ottawa, Ont. Secretary, T. Nash.

\* Since writing the above paragraph the writer notices with pleasure that action on lines similar to those suggested therein has been proposed in the Federal Parliament.



**ENGINEERS' CLUB OF TORONTO.**—96 King Street West. President, A. B. Barry; Secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

**MANITOBA LAND SURVEYORS.**—President, Geo. McPhillips; Secretary-Treasurer, C. C. Chataway, Winnipeg, Man.

**NOVA SCOTIA SOCIETY OF ENGINEERS, HALIFAX.**—President, J. H. Winfield; Secretary, S. Fenn, Bedford Row, Halifax, N.S.

**ONTARIO LAND SURVEYORS' ASSOCIATION.**—President, A. F. VanNostrand; Secretary, Killaly Gamble, 703 Temple Building, Toronto.

**WESTERN SOCIETY OF ENGINEERS,** 1735 Monadnock Block, Chicago, Ill.—Andrew Allen, President.

### ORDER OF THE RAILWAY COMMISSIONERS OF CANADA.

Copies of these orders may be secured from the Canadian Engineer for a small fee.

6037—January 14—Authorizing the Bell Telephone Company to place its wires across the G.T.R. tracks at waterfront, west of John Street, Toronto, Ont.

6038—January 14—Authorizing the C.P.R. to construct three branch lines, or spurs, on Lot 12, Concession 4, Township Balfour, District of Algoma, Ont., near Larchwood station, into premises of the Larchwood Lumber Company; and that the said branch lines be completed within 2 years from the date of this order.

6039—January 12—Authorizing the G.T.R. to provide folding gates at its crossing on Rode de Lima Street, Montreal, on or before April 15th, 1909, the city to bear one-half the cost of protection, maintenance and operation of said gates; and further ordering that the city be in no way responsible for damages resulting from negligence of the man in the tower.

6040—November 11—Authorizing the G.T.R. Company to construct certain branch lines of railway in the city of Hamilton to the premises of the Hamilton & Toronto Sewer Pipe Company and the Fowlers Canadian Company.

6041—January 14—Authorizing the Manitoba Government Telephones to place its wires across the tracks of the C.N.R. at public crossing 10 miles northwest of St. Boniface, Man.

6042—January 9—Authorizing the Louise Telephone Company to place its wires across the C.P.R. tracks between Sections 30-2-11 and 25-2-12, between Sections 30-2-11 and 31-2-11, and between Sections 4-3-11 and 5-3-11, all west of first meridian, Manitoba.

6043—January 14—Authorizing the town of Megantic, Que., to lay an eight-inch sewer pipe under the C.P.R. tracks in St. Agnes Ward, Megantic, Que.

6044—January 14—Authorizing the Board of Light and Heat Commissioners of the city of Guelph, Ont., to place 4 wires across the G.T.R. tracks at Crimea Street, Guelph.

6045—January 14—Authorizing the Manitoba Government Telephones to place its wires across the C.N.R. tracks one mile west of Grays, Man.

6046—January 14—Authorizing the C.P.R. Company to use and operate the bridges on the Emerson section of its line of railway, at mileages 28.2 and 53.6; and rescinding order No. 5712, dated November 27th, 1908.

6047—January 14—Authorizing the Kinloss & Lucknow Telephone Company to place its wires across the G.T.R. tracks one mile west of Lucknow station, Ont.

6048—January 8—Dismissing application of the R. Laidlaw Lumber Company, Toronto, for an order directing that order No. 4988, dated July 8th, 1908, be made retroactive so as to apply to all cars loaded with lumber received at Toronto over the G.T.R. from February, 1907, until the interswitching arrangements prescribed by the Board became effective September 1st, 1908, and switched by the C.P.R. to the applicant's siding at Dundas Street, Toronto; also that the

Railway Company refund \$42 as demurrage on eight carloads received at Toronto, April 1907.

6049—January 11—Authorizing the city of Hamilton to lay an iron sewer pipe under the T.H. & B. Railway Company's tracks at the intersection of Sanford Avenue and the Welland branch of the company's railway.

6050—January 13—Authorizing the city of Hamilton to lay a water main under the Port Dover branch of the G.T.R. where the same crosses Wentworth Street, Hamilton, Ont.

6051—January 12—Approving location of the C.N.O. Railway Company's line from Udney, Mara Township, County Ontario, Ont., toward Orillia; and granting leave to the C.N.R. Company to construct its railway across intervening highways in the Township of Mara.

6052—January 9—Authorizing the Peoples' Telephone Company and E. P. Smith, of Johnville, Que., to place wires across the C.P.R. tracks near Johnville station, Que., and rescinding order No. 5636, dated November 3rd, 1908.

6053—January 11—Authorizing the C.P.R. Company to construct a branch line in the city of Winnipeg, Man., across portions of blocks, 40, 41, and 42, and a lane in the rear of Brant Street.

6054—January 11—Authorizing the C.P.R. Company to construct branch lines or spurs in the city of Winnipeg to and into the premises of the Anchor Elevator and Warehousing Company.

6055—January 15—Authorizing the Alberta Railway and Irrigation Company to construct a branch line of railway on the Blood Indian Reserve, to a point in Lot 3, Block 32, in the town of Cardston, all located in Section 9, Township 3, R. 25, W. 4 M., Alberta.

6056—January 15—Authorizing the Edmonton & Slave Lake Railway Company to construct a spur to Morinville Mines, Alta., through Township 55, R. 25, W. 4 M., Alberta.

6057—January 15—Authorizing the Bell Telephone Company to place its wires across the tracks of the Lake Erie & Detroit River Railway Company at Adelaide Street, London, Ont.

6058—January 15—Authorizing the Mission Telephone Line to place its wires across the tracks of the C.P.R. Company at Dewdney station, B.C.

6059—January 15—Authorizing the Bell Telephone Company to place its wires across the tracks of the Lake Erie & Detroit River Railway Company at Adelaide Street, London, Ont.

6060—January 16—Authorizing Thomas Richards, of Elmwood, Ont., to place a wire across the G.T.R. tracks at George Street, in the town of Elmwood, Ont.

6061—January 16—Approving deviation of the C.P.R. Company's line through Saskatchewan, mileage 130.6 to mileage 133.1, being the stations of Pasqua and Moosejaw.

6062—January 16—Approving location of the Manitoba & Northwestern Railway Company's branch, Bredenbury to Kamsack, through Saskatchewan, from a point in Section 3, Township 23, R. 1, W. 2 M., at Bredenbury, to a point in Section 3, Township 27, R. 1, W. 2 M.

6063—January 16—Approving revision of the C.P.R. Company's line through Saskatchewan, from mileage 64.8 to mileage 68, being from Qu'Appelle and McLean stations.

6064—January 14—Authorizing the M.C.R.R. to construct a farm crossing over its railway, on the boundary line between the farms of Charles and Fred. Slafe, in substitution of the existing crossing on the east half of Lot 12, the crossing to be provided with separate gates, the gates to be 14 feet wide, and the crossing planked to a width of 12 feet; and rescinding order No. 5926, dated October 20th, 1908.

6065—January 22—Authorizing the Michigan Central Railway, to re-construct a bridge on Chippewa Creek on the Niagara division of its railway.

6066—January 18—Authorizing Bell Telephone Company to place its wires across C.P.R. tracks at western boundary of Lot 18, parish of Pt. Claire,  $\frac{7}{8}$  mile east of Beaconsfield station, Que.

6067—January 18—Authorizing the Vancouver Power Company to place its wires across the tracks of the C.P.R. Company at or near Barnet, B.C.

6068—January 18—Authorizing the G.T.P. Telegraph Company to place its wires across the Souris branch of the C.P.R. between Headingly and Springstein, Man.

6069—January 18—Approving location of the C.P.R. Company's Lanigan-Prince Albert branch, from a point near Lanigan in the northeast quarter of Section 21, Township 33, R. 22, W. 2 M., to a point on the northern boundary of the southeast quarter of Section 5, Township 35, R. 22, W. 2 M.

6070—January 18—Approving by-law of Dominion Express Company, authorizing Walter H. Burr, traffic manager, to prepare and issue tariffs of tolls to be charged by the said company.

6071—January 18—Approving location of the Atlantic, Quebec & Western Railway Company's station, in the town of Port Daniel, Que.

6072—January 18—Authorizing the G.T.R. Company to construct bridge on its right-of-way west of the Trent River, near Trenton, Ont.

6073—January 13—Dismissing application of the Pere Marquette Railway for permission to refund to Park Davis & Company the sum of 8 cents per 100 pounds on a shipment of pharmaceutical goods from Walkerville, Ont., to Montreal.

6074—January 18—Authorizing the C.N.O. Railway Company to construct a branch line of railway from Sellwood Junction to Sellwood, through the Township of Hutton, district of Nipissing, Ont., and directing that the said branch be constructed and completed within 2 years from the date of this order.

6075—January 15—Granting leave to the C.P.R. Company to open for traffic that portion of its line on the Medicine Hat section known as the Gull Lake division.

6076—January 12—Authorizing the G.T.R. Company to maintain at Maxville, Ont., the crossing at "A" as shown on plan on file with the Board on case 3824, file 8316, and to construct gates in line with the right-of-way fence; and directing that the G.T.R. Company be not required to cut trains standing on the siding track, for the purpose of crossing other trains on the main line at this point.

6077—January 13—Dismissing application of the Ontario Powder Company for an order authorizing the Bay of Quinte Railway Company to refund to the applicant company the sum of \$35 alleged overcharge on a shipment of ice from Tweed to Kingston, Ont.

6078—January 19—Directing the Wahnapiatae Power Company to place its transmission power lines across the tracks of the C.N.O. Railway Company in the north half Lot 1, Concession 2, Township Neelon, district of Nipissing, Ont., subject to certain conditions.

6079—January 19—Authorizing the Wahnapiatae Power Company to place its wires for the transmission of electrical power across the C.P.R. Company's tracks at mile post 70, between Romford and Wahnapiatae, Ont.

6080—January 18—Prescribing rules in connection with proposed additions to and changes in the Canadian classification of freight traffic.

6081—January 12—Approving revised location of the C.P.R. Company's Goose Lake branch, through Townships 33-29, Ranges 9-15, W. 3. M., west from Saskatoon.

6082—January 19—Authorizing the Andover & Perth Electric Light Commissioners to place their wires across the track of the C.P.R. Company in the village of Perth, County of Victoria, N.B., where the highway crosses the C.P.R. track near the end of the company's bridge crossing the St. John River.

6083—January 20—Authorizing the Canadian Pacific Railway Company to open for traffic that portion of the Moose Jaw branch of its line of railway extending from mileage 63 to mileage 91, in the Province of Saskatchewan, pro-

vided that the trains be not operated at a speed greater than fifteen miles an hour.

#### LIST OF THE MORE IMPORTANT POWER TRANSMISSION SYSTEMS OVER FORTY THOUSAND VOLTS.

Transmission lines of high voltage four years ago were not common. At that time 40,000 volt lines were the highest. Now the Ontario Hydro-Electric Power Commission are planning for a 110,000 volt transmission line and we give here a list of the more important lines over 40,000.

	Volts.
Hydro-Electric Power Commission of Ontario.....	110,000
Grand Rapids Muskegon Power Co., Michigan.....	100,000
Southern Power Company, North Carolina, No. 1..	44,000
	88,000
	100,000
Great Western Power Company, California .....	100,000
Central Colorado Power Co., Colorado, No. 1....	88,000
	and, or
	100,000
Stanislaus Power Company, California .....	104,000
Muscle Shoals Hydro-Electric Power Co., No. 1..	66,000
	or
	100,000
Telluride Power Company, Utah .....	88,000
Rio Janeiro Tramways, Brazil .....	88,000
Madison River Power Company, Montana, No. 1..	40,000
	No. 2.. 80,000
Los Angeles Edison Company, California, No. 1.	30,000
	No. 2. 80,000
California Gas & Electric Corporation, California.	75,000
Helena Power & Transmission Co., Montana....	70,000
McColl's Ferry Power Co., Pennsylvania.....	70,000
Kern River Power Company, California .....	67,500
Mt. Hood Railway and Power Co., Oregon.....	66,000
Winnipeg Municipal Plant, Manitoba .....	66,000
Connecticut River Power Company, Vermont....	66,000
Ontario Power Company, Ontario .....	60,000
Electrical Development Company, Ontario.....	60,000
Mexican Light, Heat & Power Co., Mexico....	60,000
Winnipeg Electric Railway Co., Winnipeg.....	60,000
West Kootenay Power & Light Co., B.C.....	60,000
Northern California Power Co., California .....	60,000
Inland Empire Railway Company, Washington...	60,000
White River Power Company, Washington .....	60,000
Spokane-Washington Power Co., Washington....	60,000
Snow Mountain Power Co., California .....	60,000
Washington Power Co., Washington .....	60,000
Guanajats Power & Electric Co., Mexico .....	60,000
Michoacan Power Company, Mexico .....	60,000
Puget Sound Power Co., Washington .....	58,000
Shawinigan Water & Power Co., Quebec.....	55,000
Missouri River Power Co., Montana .....	55,000
Nevada California Power Co., Nevada .....	55,000
Ammas Power Co., California .....	50,000
Columbia Improvement Co., Washington .....	52,000
Oro Water, Lighting & Power Co., California....	52,000
The Great Northern Power Co., Minnesota .....	50,000
Seattle-Tacoma Power Co., Washington .....	50,000
Taylor Falls Power Co., Minnesota .....	50,000
North Georgia Electric Company, Georgia.....	50,000
Arizona Power Co. ....	45,000
Provincial Light, Heat, & Power Co., Quebec....	44,000
Dominion Power and Transmission Co., of Ontario	44,000
Sanitary District, Chicago .....	44,000
LaCrosse Water Power Co., Wisconsin .....	44,000
Juniata Hydro-Electric Co., Pennsylvania .....	44,000

The Ottawa Electric Company carried 13,711,000 passengers last year, an increase of 1,100,000 over the previous year.

## CANADIAN SOCIETY OF CIVIL ENGINEERS.

## TWENTY-THIRD ANNUAL MEETING.

Saturday, 30th January, 1909.

## MORNING SESSION.

At the request of the President the Secretary read telegrams from Sir Sanford Fleming and Mr. H. J. Lambe regretting their inability to be present at the dinner on the previous evening. The Secretary explained that these were intended to have been read at the dinner, but were not received in time.

**THE PRESIDENT:** The Secretary has ready for distribution this morning the printed proceedings of Thursday. This is in accordance with the resolution of the meeting a year ago, and for the first time we are trying to put the will of the Society in action in this respect. It is necessary that each member return a corrected copy to the Secretary as soon as possible. These copies are merely distributed now for the purpose of enabling each member to correct his own remarks. There will no doubt be errors made in them. Any member noticing an error should notify the Secretary by returning a corrected copy. The sooner these are returned the better. We wish these records to be a credit to us, and we hope every member will take the greatest care in correcting them.

I should like to call now for the report of the Committee re Payment of Expenses of Members of Committees.

**THE SECRETARY:** Colonel Anderson, the chairman of that committee, I understand, left last night, and so did Mr. Schwitzer.

**THE PRESIDENT:** I suppose, then, the committee is not ready to report. The next item is the continuation of the discussion re Insurance or Benevolent Fund. I think it would be well to defer that until more members are present. The next is the continuation of the discussion on the report re the Usefulness of the Society. Clause 2, appearing at page 36 of the report of Council, was under consideration at the adjournment.

**MR. HUNTER:** Mr. Chairman, I think that this clause should not be further considered. We have used up a good deal of time in discussing it, and we have not come to any very definite conclusion. It seems to me, after reading the recommendations of this committee, which was appointed by the Council last year, and their recommendation referring us back to Mr. Frost's statement last year, and, after listening to the addresses last night from eminent engineers and gentlemen representing the business side of the country's progress, they all seemed to be of the opinion that the engineering brain should be allowed the widest possible scope. If we look back at our own history we will find that there is nothing that has hurt us more than exclusion laws and retaliatory laws. If we go far enough back in our own history we will find that the greatness of the Empire and its industries were acquired very largely from men who were persecuted in their own country, forced to leave, and who settled in free Britain, bringing with them the secrets of their trade. I think in a great measure the open-door policy, allowing the free access of men with brains into the British Empire has been the cause of its great and wonderful development. Shall we, as a society, try to curb in our own country the access of engineers? If we do, we must expect that other countries will retaliate against us. I do not think that Canada has ever been the first to propose legislation to exclude anyone. Unfortunately we have followed other countries with retaliatory measures, but I do not think there is an engineer in the Society that in the bottom of his heart ever approved of that course. It savours too much of trade unionism. It savours too much of trying to put the man who wants to shirk his work on the same footing as the man who is willing to work and who is climbing to the top of the ladder. I think we cannot do better than to leave the matter as it stands. (Applause.)

**MR. COUTLEE:** Mr. Chairman, I absolutely and altogether disagree with this nonsense of the theoretical state of having a professional standing as broad as the four winds of heaven. Theoretically, it is all right—we have nothing at all to say against that theory; but practically, there are ten or fifteen young fellows who were with us yesterday, and who are out of employment. There is the practical side of it. I want to put this clearly before you all, and I want to put myself on record as objecting absolutely to it. The trouble is this: The constitutions of men are the same on the south side of the line, the same in Great Britain as

in Canada, yet a medical man cannot come from the United States to Canada and practise his profession. He cannot come from Great Britain to Canada. He cannot even go from one Province to another in Canada and practise his profession. The same thing applies to lawyers. Those men have found it practical. They come in contact with business men and the rest of our people exactly as we do, and it is absolute nonsense that we should be on a different footing to them. (Applause.)

**MR. LEOPRED:** Mr. Chairman, I agree altogether with the last speaker on this matter. It is all very well to say we are in the British Empire, and so on, and we must let everyone be free to practise this or that, but one of the main questions recommended by the Council this year is to raise the level of the engineering profession. In what way in every country in the world has the level of professions, like engineering, law and medicine, been raised? In what way, if it was not by proper legislation? If it was not by excluding from the country all persons, especially the foreigners, who no one knows whether they are qualified to practise or not. Mr. Hunter seems to put the professional man on the same footing as the farmer and laborer, coming to work as laborers in the United Empire. I think, gentlemen, if we go on this way it will always be true that the young man embracing the profession of civil engineering in this country, imposing upon his parents to deprive themselves in order to put him through the regular course of instruction, as soon as he gets his diploma will have to say good-bye to his parents if he wants to earn his living and go to a land of exile. He will not be able to get his bread in this country, because here the preference is given to the man who has no diploma; between two men, one of whom has got his diploma in our institutions and one who has no diploma whatever, but says he is an American, and has worked here or there, or is an Englishman, and has worked here or there. That in the eyes of our politicians and in the eyes of the public seems to be worth much more than a diploma from Toronto University or McGill. It is suggested in this report that we do something as a society towards bringing our members before the public and getting them elected as city councillors and members of Parliament. What do they do in France to come to that end? During the last fifty years there have been several civil engineers who have attained to the position of President of the French Republic. How did they reach that high standing? In France the first thing an engineer has to do is to go through his regular literary classes; eight or ten years spent in the study of the classics; then they have to go to the polytechnic school to study mathematics; after that they are admitted to the Ecole , and that means three years. Therefore, it is no wonder these men are chosen by the public for the foremost positions in France, and that they even occupy a higher standing than the lawyers and doctors do in this country. It is due to their education and to the higher level of study compared to what they have here. Instead of spending money endeavoring to have civil engineers elected to Parliament we should spend our money to raise the level of our profession in this country. Then the public will be the first to choose them as their representatives. In Quebec we have elected a graduate of the Ecole Polytechnique of Montreal. If he had not had that education he would not be what he is to-day. Let us elevate the profession and leave it to the public to offer our members these high positions.

**MR. HUNTER:** I think, perhaps, Mr. Chairman, my remarks have been a little misunderstood. The clause we are discussing is whether the Society should take some definite stand with regard to the employment of foreign engineers in Canada. Some of our friends seem to think, I do not believe, that there should be any standard at all. Far from that, I believe the standard should be raised as high as possible, but raised by the Society of Civil Engineers and not by legislation. We do not want to mix in politics. The less we have to do with politics the better for ourselves. The curse of engineering is the meddling of politicians. If engineers were listened to and their reports acted upon as given it would be better for the country. When a politician gets hold of an engineer's report he fits it to his own ends, and then when failure occurs, who gets the blame? Not the politician; he invariably covers his retreat, and the engineer is left to bear the blame for anything that goes wrong, whether it be construction or finance. Let us keep out of politics, but let us legislate for ourselves and set our own standard.

**THE PRESIDENT:** I should like to call the attention of the meeting, now that we have a good many members present, to the fact that we have plenty of business to keep us all day. It is desirable, therefore, that everyone should carefully think over anything he wishes to say, and arrange it so that it will not be necessary for him to speak a second time, unless in rebuttal to something said by others. Otherwise we shall find difficulty in getting through with our work.

**MR. MORRIS:** I will move, seconded by Mr. Coutlee, "That it is advisable, owing to the large number of foreign engineers applying for admission to membership in the Canadian Society of Civil Engineers, to have a central board of examiners, representative of all branches of engineering, and that a committee be appointed to propose some definite system of examination for the admission of associate members and members, and report at the next general meeting of this Society. That the committee report as well on all necessary changes or additions to by-laws entailed by their recommendations." I have added a list of names as a committee that I think will meet with your approval.

**THE PRESIDENT:** Perhaps, if I may be allowed to join in the discussion, I think you ought to find something between the pages of this report on the question. One of the committees discussed that question of examination very carefully, and we could come to no satisfactory conclusion, except possibly that we had better not discuss it. The feeling was that we should look at the professional experience of the engineers, and that if, in the opinion of the Society, the time had come when graduation from some recognized engineering school could be made a prerequisite, well and good. We also thought that possibly an examination of some kind might be held for others—the younger men, who did not seem to have the full professional experience that would admit them without doubt, and who were not graduates of any school. The Society could organize a body of examiners for that purpose. I do not know whether that is printed in this report, but it was the outcome of a long discussion in the Council last year in one of the committees. I do not know but what these things might meet Mr. Morris' ideas?

**MR. MORRIS:** Yes; those are my ideas. Section 11, page 35, refers to it.

**THE PRESIDENT:** I think that is the conclusion our committee came to, but it was not presented as a report to be adopted by the annual meeting; it was simply to give information.

**MR. DAWSON:** Mr. Chairman, I full concur in your remarks. The motion as submitted is, I think, a little too indefinite. We should aim, as you suggest, at giving equivalent standing to men who have graduated from foreign universities or technical schools. That is a very simple matter; it is done amongst doctors; perhaps not lawyers, because law differs in different countries. But as far as possible it is a recognized principle in the professions that equivalent standing in other countries is accepted. Would it not be better to have a committee go into the matter, but let them have somewhat more definite instructions as to the lines to proceed upon? It is only in the case of such men as you refer to, who have nothing but experience to point to, that an examination could possibly be required. The difficulty I see at present is that admission to membership depends very largely upon a general vote of the Society. It is impossible for the individual member to judge of the experience or education of the candidate and vote intelligently; so that the present system, so far as it applies to foreign engineers, is not satisfactory. No doubt this motion will receive a large amount of support on that account, but I should like it if your suggestions were more fully embodied in the resolution as a guide to the committee.

**MR. ARMSTRONG:** Mr. President, I was authorized to promote a Bill before the New Brunswick Legislature to make a closed corporation of the Society in New Brunswick. The same question was brought up in Nova Scotia, and it was found in both cases that it was impossible to carry anything of the sort. My conclusion was that we should only ask that the title Civil Engineer should be restricted to members or associate members of the Society. That might probably carry, but to say that no one should build a bridge or draw a plan for a bridge on a highway—anything of that sort the Legislature was not prepared to consider at all. We are discussing now, apparently, two subjects in one. One is, Who shall be acknowledged civil engineers by the Society and the general public? The other is, What shall be the qualification for membership in the Society? These two subjects should

be considered separately. We should decide what the qualifications for membership of the Society should be; we should raise them and make them definite, and then we should try to get legislation that would put us in a position to hold our own before the public. I think it has been found impossible in Ontario to make a close corporation, as well as in New Brunswick and Nova Scotia.

**MR. COSTE:** Mr. Chairman, this matter of standing in the Society of Engineers has been discussed all the world over very many times. It seems to me that the admission and standing of members could be settled in a very short time in this way: instead of bringing the application for admission before the members of the Society in general it should be left entirely to the Council; or if the application were endorsed by five well-qualified members, or more, that the Council should pass upon the standing of the man and decide whether he is eligible or not, instead of sending it to a general vote. In England the application is dealt with by Council, and not by the seven or eight thousand members of the Society. That would be an impossibility. As we grow in number it will become still more difficult here. The Institute of Civil Engineers in London discussed this question, and their solution is to leave the question of eligibility for admission to the Society to Council. That is the solution I would offer. The question of examinations is impossible. Whom you are going to subject to these examinations is a very hard thing to determine. If a young man has been articled to an engineer or society of engineers, he becomes a student; after a certain number of years in practice he becomes an associate; after a further period of years he becomes a member. Now, when it comes to an application by a foreign engineer belonging to other societies, the standing of the engineer and of the society must be considered. The Council is the body to determine whether the man is eligible or not; it has the power and the facilities to get information about the applicant. It is impossible for the members to do this, especially in a country so large in extent as ours. (Applause.)

**MR. McNAB:** Mr. Chairman, I think the suggestion of Mr. Coste is the best practical solution of the whole matter, and it has been expressed in very terse and clear terms, and, I think, commends itself to the members for careful consideration.

**MR. MACPHERSON:** Mr. Chairman, I entirely concur in Mr. Coste's suggestion. It seems to me ridiculous to send out lists of men who are applying for membership, to be voted on by men who know nothing about them more than is on the ballot paper. It should be left entirely to Council.

**THE PRESIDENT:** That question is taken up in the proposed amendment to by-laws, the result of which will be announced at the close of this meeting. I think it would be well for the members to be careful about making propositions which may run counter to the result of that vote, whatever it may be.

Moved by Mr. McNab, seconded by Mr. Macpherson, that this discussion be adjourned until the result of the ballot dealing with the by-laws be announced.—Carried.

**THE PRESIDENT:**—Do you withdraw your motion, then, Mr. Morris, for the present?

**MR. MORRIS:** Oh, no; I wish it put. But before putting the question, Mr. President, this is a serious matter, especially, I may say, for the younger engineers of this Dominion. It does not affect the salaried officials of corporations.

**MR. ARMSTRONG:** Is not this out of order? I thought the discussion had been adjourned.

**MR. MORRIS:** No; I am the mover of the motion, and the motion has not yet been put.

**MR. MACPHERSON:** If an amendment is carried, does not that defeat the motion?

**THE PRESIDENT:** I am not altogether sure of that. It looks certainly as if Mr. Morris' motion were defeated by the carrying of the amendment. At the same time, if you wish to make sure it is easy to put it to the vote.

**MR. McNAB:** It is merely to economize time that the amendment was made.

**MR. MORRIS:** I thought the motion might lie over and be discussed later, but I understood the President was about to put it to the meeting, and I was not willing to allow it to go without discussion. I am willing that it should remain over for future discussion.

**THE PRESIDENT:** Then that is understood. The next clause is 3, and I think 4 may be taken with it: "Is the existing provincial legislation beneficial or detrimental to the Society? If

beneficial, should it be extended to other Provinces, and if detrimental, should it be repealed in Manitoba and Quebec? Should the title, Civil Engineer, be controlled by legislation?"

MR. COSTE: May I ask, Mr. Chairman, what provincial legislation means in this case?

THE PRESIDENT: I think it means in certain Provinces, Quebec and Manitoba.

THE SECRETARY: We only have legislation in two Provinces, Quebec and Manitoba; that is, the existing legislation.

Moved by Mr. Armstrong, seconded by Mr McNab, that the discussion of clauses 3 and 4 be deferred till after the balloting on by-laws.

THE PRESIDENT: Then No. 5, "Should the Society as a body interfere in cases of dispute between a member and his client, and under what conditions or authority?" (No, no.)

MR. MCNAB: I would ask what is the meaning of that query, Mr. Chairman? Is it that the Society shall be an arbiter?

THE PRESIDENT: Several cases have come already before the Council in which members have complained against their treatment by corporations and others who employed them, and asked whether it was possible for the Society to aid them in any way. Nothing special was suggested in the cases I am thinking of.

MR. COSTE: I do not see Mr. Chairman, how a thing of this kind would help any engineer. I might, perhaps, relate, very shortly, my experience. When I arrived from the Old Country I desired to get into the service of the Canadian Pacific Railway. I went to see Mr. VanHorne, and I asked him to put me on the engineering staff of the Canadian Pacific Railway as a young man. His answer was: "We don't want any of your damn theoretical men here." And I had to go to the Premier of the country, to Sir John Macdonald, and explain my case; a young Canadian returning home after getting an education on the other side and being refused work in my own country. Sir John Macdonald insisted that Mr. VanHorne should take me, and Mr. VanHorne called his chief engineer, and said: "Take this young man on your staff and sack him within eight days." (Laughter.)

MR. MACPHERSON: Apparently those instructions were not carried out.

THE PRESIDENT: Is it your pleasure, then, that we pass on?—Carried. The next clause is 6. "Is it in the Society's interest to take active measures in the discussion of public matters involving national development or the conservation of national resources, and, if so, what is the best way to proceed in order that the Society's action may be forceful?"

MR. MOUNTAIN: In reference to that clause, Mr President, there is a Committee on Transportation, the work of which will come under that heading to some extent. The report has been printed and will be laid before the meeting. It also deals with the last part of the clause as to the best way to proceed.

Moved by Mr. Hunter, seconded by Mr. LeGrand, that Clause 6 be discussed at the same time as the report of the Transportation Committee.—Carried.

MR. MOUNTAIN: I would not desire the meeting to think that there is any very great amount of information in the report of the Committee on Transportation. I am chairman of that committee, but I took it very late in the year at the request of the retiring chairman. We have merely a progress report.

THE PRESIDENT: The whole of Clause 6, then, will be discussed with the report of the Committee on Transportation. The next is 7. I suppose that is really of a character that can be discussed along with the other two or three that were deferred? The same may be said of the remaining clauses. That disposes for the present of these clauses in the General Report of Council. The next item is the reception and consideration of the Report of the Cement Committee. That is not yet ready, and while we are waiting for it we will take up the Report of the Transportation Committee. Perhaps Mr. Mountain will give a short resumé of the report.

MR. MOUNTAIN: Mr. Chairman, this committee was formed, I think, at the last annual meeting, if not the meeting before. Mr. Butler was appointed chairman, and I was placed on the committee. Mr. Butler stated that, owing to the large amount of work he had on hand he had not had time to call the committee together, and he asked me whether I would take the chairmanship if he resigned it. He stated that the Committee on Transportation was appointed to look into the question of rails, fastenings,

roadbed, transportation and routes. It seemed to me a large amount of work to give one committee. However, that is the way I received it. Mr. Butler resigned some time in September, and at the latter end of September I took the chairmanship of this committee. Shortly after that the Committee on Transportation decided to sub-divide the committee into four sub-committees as follows: Rails, Fastenings and Tie-plates—Chairman, Mr. H. G. Kelly. Mr. Kelly is Chief Engineer of the Grand Trunk Railway, and has had a good deal to do with the same subject in connection with the American Railway and Maintenance of Way Association. Ties—Chairman, G. Macpherson. Mr. Macpherson also had a good deal to do for the American Society of Maintenance. Roadbed and Ballast—Mr. Sullivan. Then a much larger sub-committee was formed on what we afterwards called Transportation Routes. This committee was composed of quite a few members of the Society, and a great number of men were asked to co-operate. The names do not appear here, but they do on the list that we made up. We have the names of representatives of all railway lines in Canada, all steamship lines on the Great Lakes, and the names of men interested in transportation by water, canals, and in terminals. Owing to the large amount of work necessary to get all this matter together your committee ask to be continued for another year. They do not admit that they have not done any work in the short time they have taken hold. A great deal of information has been got together, a great many maps of different routes, and information as to the cost of transportation. but we felt that it was not complete enough in any way to put it more fully in the report to this annual meeting, and we, therefore, ask to be allowed to continue the investigation for another year. I trust, sir, that the annual meeting will be lenient and admit that, and we will endeavor to bring in something better next year. The diagram that is now being distributed shows the rail sections referred to in the report of the Sub-Committee on Rails.

THE PRESIDENT: It is a little difficult to discuss a report intelligently immediately after its distribution. The main point, as far as the business of the Society at this meeting is concerned, is that Mr. Mountain suggests that the committee be continued, so there is not much danger of our making a mistake if we cannot fully discuss his report now.

MR. COSTE: Mr. Chairman, the committee goes into a number of details, such as rails, fastenings, ties, roadbed, ballasting, practically discussing the whole of railway construction. In a similar way I ask why they did not go into the construction of vessels; the construction of everything that carries or helps to carry. I believe that the country is growing far beyond the power this Society has in giving that committee its mission.

MR. MOUNTAIN: Then I must ask for further instructions. I agree with Mr. Coste, that it did seem to me that the name of the committee was a misnomer in some ways. I asked last year for a committee on rails. I was anxious about that because the Dominion Railway Board had asked me to look very carefully into that question of the breaking of rails and I thought that there could be no better medium of finding it out than through this Society. I came into the meeting late and I was informed by the chairman that a committee had already been appointed to cover that, and after the meeting I looked it up and found that it was the Committee on Transportation. This is the way it was handed down to me by my predecessor, the chairman of the committee. Now, in answer to Mr. Coste, I presume the question of steamboats on the lakes will come up. Mr. Playfair and men of that kind were put on this committee to co-operate and I assure him it is a very large committee. Nearly every gentleman interested in shipbuilding and operation on the lakes is on this committee.

MR. COSTE: The point I was trying to make, Mr. Chairman, was that these various details of construction, such as rails, ties, and roadbeds, are not a report on transportation. If you go into the details mentioned why not also culverts, bridges, and the whole of railway construction?

MR. MOUNTAIN: I concur with Mr. Coste's views and if we can be relieved from any of these duties I shall be glad. It is a great deal of work. Since September I have attended three or four meetings of this committee alone.

MR. KERRY: For information, Mr. President, I wish you would tell us what this committee is, what it was appointed for, and when and what its limit is.

THE PRESIDENT: A lot of that information was given before you came in, Mr. Kerry.

MR. KERRY: I must apologize to the Chair then.

THE PRESIDENT: Perhaps Mr. Mountain will answer Mr. Kerry's question.

MR. MOUNTAIN: This committee was formed, in my opinion, Mr. Chairman, for the purpose of reporting to this Society the views obtained as to the most economical routes of transportation between the different provinces of the Dominion. If anything can be found to make transportation cheaper from west to east, to off-set the danger of that transportation going from north to south. That is what it was intended for.

MR. COSTE: I thought the idea was to discuss the principal routes and the difference between the cost of transportation by rail or water without going into the detail of actual construction of railways, which is a very wide subject and comprises the whole engineering profession. Is it not the general idea of locating or mapping routes between the different provinces and the different modes of transportation without going into the actual size of rails or whether ties should be tamarack or something else. These papers I admit are useful, but should they not be treated as ordinary papers by a member of the committee and be read at the proper time? A discussion of this kind would take weeks and cannot be considered at an Annual Meeting.

THE PRESIDENT: One of the reports of sub-committees seems to deal with the general question of transportation routes and trade. Mr. McNab is chairman of it.

MR. MCNAB: Mr. Chairman, it is understood that this committee has just recently met, but personally I consider that this matter should be in the hands of a Transportation Committee which would deal with transportation routes, and the other part that Mr. Coste has referred to I think should be a separate committee under Permanent Way or something of that nature. I do not see that the two are bound up together. Transportation routes mean, as Mr. Mountain said, an investigation into economic conditions, the cost of transport by rail or water, or a combination of both. Rails, ballast and so on, I think should be under a committee on Permanent Way.

THE PRESIDENT: It seems to me that that is a very sensible suggestion.

MR. MOUNTAIN: I concur in those views, and I thought that was the way it should have been done in the first place. If we are going into that I move that this committee be dismissed and new ones formed.

THE PRESIDENT: You think the whole question of routes and so on in connection with transportation should be given to a separate committee altogether, apart from the question of details of construction.

MR. MOUNTAIN: I did think that, Mr. President, but I see one thing against dividing them again. The sub-committees are largely intermixed. There are different chairmen but a great many of the members are the same. They come a considerable distance to attend these meetings and sometimes they can hold two of them in one evening. If you keep adding committee after committee you will get no work done. Broadly speaking I think rails, ties and roadbed do come under the heading of transportation, the same as anything else, but if you wish to change this committee at this meeting I would ask that the former committee be dismissed and that I be relieved from office for the year. There are, apparently, other duties for me and the work of this committee is a difficult task.

MR. MCNAB: I think what Mr. Mountain has said that the connection of the same personnel with a number of committees with a different chairman, is pertinent. The matter of meeting in one evening could surely be arranged through the Secretary. So far I have had the experience of two of these committees meeting on one evening.

MR. JAMESON: Mr. President, while I do not consider that the work of the committee as at present constituted is organized in the best manner possible, at the same time all these subjects have a very large bearing on transportation and it is difficult to separate. If you consider a rail route you have to consider grades, curvature, weight of rails and so on. Those are really sub-committees of the larger committee and furnish information to the larger committee in connection with transportation. In the same way if we deal with waterways we must have information with re-

gard to the cost of buildings and operating ships, the time occupied in going through locks or river stretches and what bearing that has on the cost of bearing cargoes. So that while we may not be in the best shape possible, yet I would be strongly in favour of allowing this committee to continue as at present constituted. If the question of transportation is not properly dealt with we had better leave it entirely alone. If we are going to make it of any value to the country and thus raise the prestige of our Society, it must be gone into carefully and minutely, so that the report may be quoted as an authority on the subject. The committee, I think, have got well started on their work and you cannot expect any more than that when there are so many points to be dealt with.

MR. MOUNTAIN: I would ask that the resolution passed at the last Annual meeting be read so that we may know the instructions that were given to this committee.

MR. ARMSTRONG: Mr. President, I would move that the committee be continued with power to add to its numbers and that it be asked to bring in two reports; one on Business Transportation Proper, embracing routes and such subjects, and another report dealing with details not embraced in the business part of the proposition.

THE PRESIDENT: I will defer putting that until the Secretary finds the instructions of last year.

MR. BIRCHELL: (Sydney), Mr. President and gentlemen, it appears to me, and I am sure it must strike us all, that this committee has undertaken in a far-reaching way work that will be of great value not only in the determination of the matters in issue but for the general information of the Society. With those who have spoken, I strongly favour the continuance of this committee with a clear instruction from the Society that they follow out the lines that they have taken up, whether strictly included in the specification of the work outlined or not. With the information before us it looks as though our committee were proceeding by a method of synthesis as compared with an analytical method of arriving at the ends they desire to reach. It is to be expected that in considering these various routes that differences will be found in the cost of transportation arising from various factors in the problem, the maintenance of way, the maintenance of rolling stock, and moving of rolling stock and so on; and the reasons for these differences will naturally be matters of great interest. In ascertaining these reasons it will be important to know the character of the permanent way and the cost of rails, sleepers, and so on. The committee will give us information as to the cost per mile of road and per train mile, of maintenance, and of conducting transportation, and so on. We shall want to know the reasons for these differences. All this information which is outlined and foreshadowed by the committee will be of very great value. I therefore strongly support any motion looking to the continuation of the work of this committee and the carrying out by them of the work that they have in contemplation as outlined by the report submitted. (Applause).

THE PRESIDENT: The only information that is in our possession at present in respect to this committee is in the report of the Annual Meeting held a year ago. This is what I have. "In the absence of Mr. M. J. Butler, Mr. H. Holgate was requested to present the report of the Transportation Committee. Mr. Holgate stated that the committee had found difficulty in arranging meetings and was unable to present a definite report, but that there had been numerous informal discussions among the members. He suggested that the committee be continued for another year. After discussion the committee was re-appointed with instructions to continue its work for another year." The rest of the information is in the minutes of Council, and is not here.

THE SECRETARY: The committee originated on a suggestion coming before Council from two members; one from Mr. M. J. Butler, and the other from Mr. H. Holgate, both practically suggesting the same kind of work and giving a general outline of their ideas in regard to the work, which outline has, I think, been fairly well adhered to in this report which has been put in.

MR. JAMESON: Mr. President, while it is true that very little or practically no progress was made last year, and during the past year not much progress was made during the first part of it, I think now that real progress is being made; the members of these sub-committees have taken the work up in earnest. It is a big subject and we cannot wonder that it has taken considerable time

to get it under way. Now that we have it under way I think it would be unwise to tamper with it, and therefore the committee should be continued as requested by the chairman. The mode of working it out by sub-committees should be left entirely to the committee. The question before us is whether we are willing to continue that committee or not. I would request that it be so put.

Moved by Mr. Mountain, seconded by Mr. Jameson, that the committee be continued.

MR. ARMSTRONG: My motion would come in as an amendment, I suppose. It merely provides that they bring in two separate reports; one including transportation as generally understood, which might include grades, and that the second report go into the details, so that they may be discussed separately.

MR. LEOFRED: I think my friend will see that it is the intention of the committee to present two reports and more. It is their intention to present four reports.

MR. MOUNTAIN: The reports are from sub-committees to the Committee on Transportation. But when the Committee on Transportation reports to this meeting it will only have one report.

MR. COSTE: I have no objection to committees doing all kinds of work, the more the better. But these reports should not be made to the Annual Meeting. They should go through the general routine of the Society in Montreal, at headquarters. It is an impossibility to take up in two days a question of this magnitude. We cannot discuss these details at an Annual Meeting. The construction of railways, steamers and elevators are subjects of a great deal of interest in the transportation question, but they are merely a means to an end. The more information we get about them the better, but that is work for the Society at its meetings in Montreal. It is not work for an Annual Meeting. The only subjects that should come before us here are the subjects of general interest and not details. The time at our disposal is too short. To adequately discuss this report will take hours.

MR. JAMESON: I think we are losing valuable time. The only question before the meeting is the motion to continue the committee. I would ask Mr. Armstrong to withdraw his amendment.

MR. KERRY: Mr. Chairman, before you put the motion I would like to be clear on one point. We are all pleased to have an active committee and we are delighted to continue them in their activity, but we have a report before us from that committee. I have not seen it. To what extent in continuing this committee do we accept that report? Does it become an official document of the Society in any way. Is it to be considered as a document approved by the Society or is it merely information for us?

THE PRESIDENT: The question Mr. Kerry brings up is one that has occurred to me. The great trouble with our Society is this; let us suppose that the main duty of the Annual Meeting be confined say, to making suggestions to the incoming Council; that all the other work shall be done by the Council, and the annual Meeting be simply an initiator of new ideas. That seems a very simple and proper idea of dividing the work between the Annual Meeting and the continuous body of Council. But those of us who have had experience of Council know that we have gathered together and sat from nearly eight o'clock until past twelve in getting through ordinary routine work. Work of great importance, of course, but not of the character of these questions. There is a very heavy burden of that kind of work on the Council. If we can make time at the Annual Meetings for discussing, adopting and making our own or rejecting the reports made to the Annual Meeting, it will be well. I do not know where else we are going to do it. We do not seem to have the organization or machinery to get through our work properly.

MR. KERRY: I would suggest, Mr. Chairman, following your remarks, that a committee of this kind should be appointed by the Council and should report to Council. If considered necessary, that report could be referred to the Annual Meeting with a recommendation by Council that it be adopted by the Society as a whole. My recollection is that the committee was originally a committee of Council. By some mistake at the last Annual Meeting a committee of Council was continued as a committee of the Society.

MR. MOUNTAIN: It has become a committee of the Society since the last Annual Meeting, and your committee do not ask that any action be taken on the report. It was intended as a progress report, to show that they had not been altogether idle, although it is a long time since the committee was formed.

MR. MURDOCH: It is simply a progress report and a request to be continued. We are not discussing the report.

MR. KERRY: I think an amendment is still in order. I would move in amendment that the committee be thanked for its services and discontinued and that a recommendation be made by this meeting to Council that it arrange for the continuance of this work by the same committee.

MR. RUST: I will second that motion.

MR. JAMESON: In speaking to that I will just sound a word of warning to the meeting. You must deal fairly with your committees if you wish them to do the work. There is a large amount of work and very much time is involved in doing it. You must leave them a fair amount of latitude. If at the Annual Meeting someone who is not familiar with the amount of work that has been done or the exact state of affairs practically moves a vote of want of confidence, you will not be able to get committees to act.

MR. MOUNTAIN: Just a word, Mr. Chairman. This committee has invited such men as the Allans and others connected with the different transportation companies. The committee felt that it had not enough information on hand to ask these gentlemen to appear at their meetings as yet, but they have all accepted. They have not yet been asked to attend. I think it would be extremely objectionable to dismiss the committee at this stage. I for one would feel that very strongly.

MR. McNAB: Mr. Chairman, I consider that the amendment proposed by Mr. Kerry is very uncomplimentary to the gentlemen who have been doing the work of the sub-committees. Something has been presented for the information of the Annual Meeting but it was not intended to be discussed in detail as a recommendation. I think if the Annual Meeting will allow this committee to go on for a year until they produce something—if it is not in line with the views of the meeting then discharge them, but do give them a chance before you discharge them.—(Applause).

THE PRESIDENT: Perhaps both views might be combined. The committee may be continued as at present and I think Mr. Mountain would have no objection that the report of the Transportation Committee should be presented to the next Annual Meeting through the Council. In that way Mr. Kerry's idea could be carried out in the future business of the Society. It is not with regard to this special Committee of Transportation that Mr. Kerry is speaking.

MR. KERRY: No, it is entirely a matter of general procedure.

MR. MOUNTAIN: He used the words "discontinue the committee."

THE PRESIDENT: It is unfortunate to use this Committee on Transportation as a corpus vile on which to act in the first place.

MR. KERRY: Mr. McNab and Mr. Jameson have completely misunderstood the tenor of my motion. The motion is not to dismiss the committee or discontinue their labours. It simply places the machinery in a little different shape so that the appointment of the same committee shall come from the Council and not from the Society. As Mr. Coste says it is out of the question for this meeting to discuss at length so important a recommendation. We must recognize that the Society has grown into a very important body and that any official action must be very carefully considered before it is taken. I think it proper that anything coming before the Society for action should be thoroughly considered and recommended, and everyone should have time to look into it before we are asked for approval. It is simply to avoid that difficulty and not in any way to interfere with the programme these gentlemen have mapped out.

THE PRESIDENT: Could you put your motion in this way that as far as possible the report of committee to the Annual Meeting be made to the Council? How would that do without reference to this special committee?

MR. KERRY: That would be quite satisfactory, Mr. Chairman.

THE PRESIDENT: If the meeting agrees, I will put Mr. Mountain's motion as a substantive motion, and also Mr. Kerry's after it is altered in that way.

MR. McNAB: I think Mr. Kerry is perfectly right in what he has said, that it is impossible to discuss intelligently questions of that kind at this meeting, when you get the information handed to you just as you come in the door. A great deal of that is largely the fault of ourselves in our management of the Society. If we or the Council would see that these things were out in sufficient time for the members to get them and thoroughly digest them before they come here, a great deal of time would be saved.

MR. MOUNTAIN: I will apologize for that, Mr. Chairman, it is no fault of the Executive of the Society. It is the fault of our committee.

THE PRESIDENT: Will you repeat your motion, Mr. Mountain?

MR. MOUNTAIN: My motion is that this committee be allowed to continue their investigations for another year. I do not agree with Mr. Kerry's motion.

THE PRESIDENT: You have heard the motion of Mr. Mountain, seconded by Mr. Murdoch. I declare the motion carried.

Then, Mr. Kerry, would you put your motion in a more general way? While Mr. Kerry is preparing his motion perhaps we may proceed with something else.

MR. MOUNTAIN: This question of cement will take some time. I would like to finish Clause 6 that we laid over.

MR. RUST: If I may interrupt, I have a short report that will not take a minute. It is on out-of-pocket expenses.

THE PRESIDENT: Is it the pleasure of the meeting that while Mr. Kerry is preparing his motion, that the report of the Committee on Out-of-Pocket Expenses be read?—Carried.

MR. RUST: "Your committee beg to report that in their opinion it is not advisable to make any recommendation but that the Council should have the power to deal with this matter." I move the adoption of that report, seconded by Mr. Leofred.

THE PRESIDENT: It is moved by Mr. Rust, seconded by Mr. Leofred that the report be adopted.—Carried.

THE PRESIDENT: Now, Mr. Kerry?

MR. KERRY: "Moved that the reports of special committees appointed by this Annual Meeting shall be submitted to Council and by it transmitted to the next Annual Meeting with such recommendations for action as it may deem advisable."

MR. MOUNTAIN: I have no objection to that. I did not think that was the way it was going to be put.

THE PRESIDENT: That is what I thought might be done. It is unfortunate that the two questions got mixed up. You have heard Mr. Kerry's motion; it is seconded by Mr. Coste.—Carried.

MR. ARMSTRONG: 'Is it understood that passenger transportation is included in the work of that committee? I was thinking of moving that Council be asked to take up the question of passenger rates; whether members, associate members or students of the Society should not be given at least the same advantages as members of the Commercial Travellers Association.

THE PRESIDENT: That will come in as a piece of extra business after the regular business is disposed of. I do not think it has any connection with the Transportation Committee.

MR. JAMESON: Mr. President and gentlemen, the report of the Cement Committee, accompanying the specification prepared by the committee is not printed for distribution. It was got ready too late to go through with the rush of other printing just before the meeting. The specification here is headed a little wrongly; "Report of Committee on Standard Method of Testing, and Specifications for Portland Cement." This does not, as printed, constitute the report itself, but it is the specification and the standard rules for testing. In connection with that I will read our report in presenting it.

MR. COSTE: Mr. Chairman, I object. I contend that this is not the business of a General Meeting; this is a paper which ought to be read in the regular way before the Society of Engineers and not at the Annual Meeting. We are not here to listen to discussions of this kind. The Annual Meeting is not for the purpose of lecturing the engineering profession as to what they shall adopt in the way of standards. That should be done at meetings of Council and at the regular meetings of the Society in Montreal. I object to losing an hour of my time now in reading a specification on cement.

MR. JAMESON: Mr. Coste is entirely out of order. This is for distribution; we do not propose reading this; we propose to present our report. We were appointed by the Annual Meeting as a committee and we report to the Annual Meeting and we present our report accompanied by the specification.

THE PRESIDENT: It seems to me that Mr. Jameson is in order. A motion has just been adopted that in future these reports shall be presented through Council, but that does not affect this report. I agree with Mr. Coste that we cannot discuss this at present; we should have time to read and consider these important reports. The report should be presented in the usual way, and then it remains for the Society to say what shall be done with it. Mr. Jameson may give a general resume for the information of the Society as to what has been done by the committee, without reading the report.

MR. JAMESON: I do not propose to discuss the specification as herein presented. I take this ground, that if this Society appoints a committee it has confidence in that committee to deal with the subject referred to it. I can assure you that this work has occupied the committee for many weeks, and the most minute attention of the members has been given to it. Then when we come to the Annual Meeting to present our report, something that has been thoroughly digested and studied, if we are going to have objections raised on every corner, I certainly will refuse to act on any committee under those conditions.

THE PRESIDENT: Are you referring to anything I have said personally?

MR. JAMESON: No, I refer to the question raised by Mr. Coste.

THE PRESIDENT: At the same time I am sure you do not mean the Society to understand that any committee should expect its report to be adopted by the Society simply because it has put experts on the committee.

MR. JAMESON: No, I expect to take up the points in that report and have them discussed. I do not expect the meeting to adopt it without consideration.

MR. HUNTER: It seems to me, Mr. Chairman, that in parliamentary usage any man has a right to preface a motion he wishes to make. A committee having brought in its report, it does not seem right to that committee to deny them the right to preface a few remarks in regard to the report they offer. I believe it is simply the intention of Mr. Jameson to give a few introductory remarks in presenting his report.

THE PRESIDENT: I think Mr. Jameson is proceeding in that way. That is what I meant when I asked him to make a general explanation to the meeting. I do not know where Mr. Hunter gets the impression that any member of the Society wishes to suppress the explanations of Mr. Jameson.

MR. HUNTER: The point of order was raised distinctly on that. Mr. Jameson has said two or three words as a preface when a point of order was raised.

THE PRESIDENT: I think I settled that point of order.

MR. McNAB: Mr. Jameson has started to present a report. May I ask if this is a report of progress of what the committee has done or is the meeting to be asked to pass upon any of the conclusions? I think it would be unfair for us to go on record before the country with a small meeting like this without thoroughly digesting the resolution.

THE PRESIDENT: I do not know whether you heard me or not, but I think I said that under our present practice, which has not yet been modified, Mr. Jameson is in order.

MR. JAMESON: The remarks I have made preparatory to presenting the report were only in the way of an explanation as to how the matter stood and what I was going to present. This is headed, "Report of Committee on Standard Method of Testing, and Specifications for Portland Cement." That is the report strictly applied to the specification and the rules for testing. We consider up to date that our work is at an end, but we feel that we have been deficient in the past; in our Society there has been no one to look after keeping the specifications up, and the result has been that our late specification has been out of date for some years. As to the second paragraph, we have discussed this very fully, and there are so many reasons for trying to get a standard package and so many reasons in favour of 100 pounds becoming the standard package that we feel like recommending this strongly to the Society to use all their influence towards that end. The usual package is a bag. There is no reason why every country should have a different package. There is no reason why the Canadian package should be lighter in weight than practically any other, 87½ pounds. The American 94. The committee has had this question up with the manufacturers and discussed it very fully with their committee at our joint meeting. While not definitely committing themselves the manufacturers' committee expressed themselves generally and some strongly in favour of the 100-pound package. A number of the manufacturers individually are in favour of coming to that while others are against it on account of the expense of making the change. That is, they have a large stock, amounting sometimes to 40 or 50,000 dollars worth of bags on hand, and they are not sufficiently large to hold a hundred pounds. But I know some of them are preparing to order bigger bags to meet our suggestions, irrespective of their Association as a whole. It is necessary to give them time



to gradually make the change. I have been advised by the Secretary of the Manufacturers Association that at a meeting of the cement branch of the Association, held at a recent date, they voted against making any change, and requested the Canadian Society of Civil Engineers to act with them in endeavouring to obtain legislation towards standardizing 87½ pounds as the package. Which I regret we cannot do.

MR. COSTE: Mr. Chairman, we are discussing the report. The report has been submitted and action should be taken on it. We are commencing an endless discussion. If Mr. Jameson has a right to discuss his report, so have we. This is not business for the Annual Meeting. We are doing the work of children here; attempting to discuss an important subject that would take a week to discuss. I concede that this is most important work, and that it has been extremely well done by the committee, but we have not time to discuss it at the Annual Meeting. These things should be put in formal papers, either by individual members or by a committee such as that of which Mr. Jameson is chairman, and should form part of our proceedings as a Society. Following the British rule of presenting the paper, having it read by the author and discussed in the regular meetings of the Society and not at the Annual Meeting.

MR. JAMESON: I have a right to comment on the different parts of this and tell the state of affairs and how everything stands.

MR. COSTE: I submit that Mr. Jameson has no right to comment on his report. He has the right to explain in a general way the reason for the action taken by the Annual Meeting in forming the committee, but surely Mr. Jameson has no right in reading his report to take it up clause by clause and discuss it on questions of merit.

THE PRESIDENT: I think it will remain for the meeting to discuss the disposal of Mr. Jameson's report. Mr. Jameson will soon be finished, and very little time will be taken up.

MR. MORRIS: We are doing the work of Council here, Mr. President. These are papers that should be read at the regular meetings and not at the Annual Meeting. This meeting is for business, and we have done practically no business since the meeting started.

THE PRESIDENT: The business before us is that this is a report of a committee appointed by the Annual Meeting, to be made to the Annual Meeting, and until the method of working that you approved of this morning comes into force we have no other method of dealing with it than at the Annual Meeting. (Applause.)

MR. JAMESON: Mr. Morris is under a wrong impression. This is not a paper nor a subject for a paper. All other societies deal with reports of committees in the same way.

MR. COSTE: I object to this discussion, Mr. President. Mr. Jameson is making a statement he is not able to prove. This is not the procedure at the Annual Meeting of the American Society of Civil Engineers, nor the British nor the French Societies.

MR. JAMESON: Mr. Coste will pardon me, I know what I speak of in regard to a couple of the societies, and have been present at meetings when reports on this very same subject have been presented, and I know how they were dealt with.

THE PRESIDENT: This matter was fully explained at the last session on Thursday. In the report of Council there has been a typographical error made on page 5 by the omission of a heading. That heading should have been, Reports of Committees to be made to the Annual Meeting. It is put in the report of Council for the sake of compactness and convenience and does not form a part of the Council's report at all. That should have been explained in the heading on No. 5. Under that heading comes the Report of the Committee on Cement, the Committee on Transportation, and the Committee on the Establishment of Testing Laboratories. The mistake that has arisen in the members' minds arises from a mistake of the printer in not putting the heading there explaining what that means.

MR. COSTE: That is the position I have taken right through, Mr. President; that we are here not to discuss the reports of sub-committees but the Report of Council. We have three days at our disposal and one is taken up by excursion. The general questions of the Society are all that should be discussed here and not the reading of papers.

THE PRESIDENT: To make my position clear. It is plain that the reports of committees appointed by the Annual Meeting must

be made to the Annual Meeting. There has, apparently, been no provision made for the discussion of reports of this character. I admit the difficulty of discussing a scientific report of this kind in the little time we have. We have made an attempt to remedy that in future, but at present I think Mr. Jameson must be allowed to go on. We cannot adopt a report of this kind without having a chance to look into it, and I do not think Mr. Jameson expects that. He simply requires some proper disposal of the report so that it will receive full consideration, and I think we are coming to that.

MR. JAMESON: Reports of this kind must be submitted and explanations given in connection with them, and that is all I am attempting. There is no machinery I know of to put such a specification as this in force except by putting it through the transactions and being generally acceptable. We must not put ourselves as a Society in an awkward position. We are dealing with other important bodies in this question, such as the Cement Branch of the Manufacturers Association. They recognize as well as we do the importance of having a specification on which all can agree, so that they will manufacture a good grade of cement and at the same time meet the conditions of the engineers. The American Society issue their specification as a recommendation of their committee on cement, with the names of the committee behind it to give it standing, without guaranteeing it as a society. What we are attempting to do here is certainly a step in the right direction. We have made a great deal of progress when we succeed in getting the manufacturers to agree with us on our specification. In this connection I will read a letter from the Secretary of the Manufacturers Association showing their acceptance of this specification which I present. It is addressed to myself as chairman of the committee. (Reads this letter.) That analysis is what we originally set it at; some of the members of the committee thought we ought to reduce the SO<sub>3</sub>, but that was finally decided on, so that we have there an acceptance of this specification and standard methods of testing from the manufacturers, which is a great step in advance. As I have said in my report, this is largely in line with the standard specification and methods of testing adopted by the American Society of Engineers and American Society for Testing Materials. Certain departures have, however, been made with a view of improving it and making it a little more specific. In presenting this, while I do not think that it is possible to discuss it generally, yet members may have some point that they would like to refer to.

THE PRESIDENT: What is the best disposal in the interests of the Society that you would suggest for your report? It is a very valuable and exhaustive report, and I would like to know what your own ideas are on that subject.

MR. JAMESON: Our by-laws and procedure are a little deficient in just such a case as this, as to making this a standard specification of the Canadian Society. I am not sure how far we can go in that respect, but my suggestion would be for the Society to receive this from the committee and issue it as a specification recommended by the Committee on Portland Cement. The Secretary might be able to give us some light on that point.

THE PRESIDENT: That would be almost the same as adopting it by the Society. Unfortunately, as in the case of the report of the Transportation Committee, our procedure for disposing of such reports is badly out of order. As I have said, we are not in a position to discuss the report; we have not read it. I think, if I may express an opinion, that the report should be circulated among the members without adoption and without any recommendation from this Annual Meeting. It should be circulated certainly among the branches and the scattered engineers in other districts. I do not think Mr. Jameson's committee would object to its being distributed for their examination and possibly have it reported back with a view to final adoption at the next Annual Meeting.

MR. JAMESON: That is rather long. If we are to deal with it we should deal with it promptly.

MR. MORRIS: I would move that this be received by the Society and referred to the Council with power to refer back to the committee with any recommendations of the Council.

MR. LEGRAND: I should like to see it sent to the section meetings, and then discussed for adoption.

MR. JAMESON: This may assist us a little. Here is a similar one issued by the American Society of Civil Engineers. It is

issued in pamphlet form as well as printed in the Transactions of the Society and the Records of their Annual Meeting. "Progress Report of the Special Committee on Uniform Tests of Cement, presented at the Annual Meeting, January 21st, 1903." They give the names of the committee and they say, "This report is reprinted for the purpose of receiving comment and discussion, which may be useful to the committee in formulating its final report." This was a Progress Report, and in fact their committee is a standing committee. It is not final. From year to year they keep adding to it.

THE PRESIDENT: It is more than that. It is exactly in the line of the suggestions I have just made; that instead of this committee adopting your report that it print it and distribute it among the members of the Society for suggestions. It is printed for the purpose of making it the basis of new suggestions for the specification, for which the Society will be responsible.

MR. JAMESON: One fact remains, that their specifications and their methods of testing have been almost universally adopted by their members, and largely by others in the United States. Without giving it any more sanction than that. If we are going to do anything as a Society, if we are going to have our members say, "In accordance with the specification of the American Society of Civil Engineers," or enable them to say, "In accordance with the specification of the Canadian Society of Civil Engineers," that is the question for you to deal with.

MR. COSTE: I rise to a point of order, Mr. Chairman. I am going to make myself a nuisance to the last, but this discussion is entirely out of order. We are not discussing a question of that kind. Mr. Jameson is presenting his report. The remarks of Mr. Jameson are not in point at all. We are not discussing what the Americans are doing or what we are going to do with Mr. Jameson's report. There is nothing personal in my objection. It is merely a question of procedure. Our meeting is, I contend, becoming an absolute farce. We have over 400 members of the Society, and there are twenty-four of us here in the room to discuss a question of this kind.

THE PRESIDENT: Perhaps it would be well to bring it to a close by putting a motion, Mr. Jameson.

MR. ARMSTRONG: I have a motion to offer. I move that the first part of the report which Mr. Jameson has read be divided into three heads; the first part, then the recommendation and then the question as to the weight be accepted. And that the other part of the report be referred to the Council with power to put it before the members of the Society and discuss it. They might, if they thought fit, issue it as a provisional specification for testing and use of cement.

THE PRESIDENT: Will you shorten it by saying that you move that the report of the Cement Committee be received.

MR. ARMSTRONG: Yes, and that it be considered in sections. Each part must be considered by itself. You must divide it into sections so that we will discuss one point at a time. Mr. Coutlee seconds my motion.

MR. COSTE: I move that the report just read of the cement testing be referred to the incoming Council of the Society of Civil Engineers for their consideration and for any action they may take in regard to it.

MR. MORRIS: I second that. That is practically the resolution I wished to make.

MR. J. H. HUNTER: I move in amendment that the report be received and issued to all members, and that after a reasonable time a letter ballot should be taken on adoption of the specification of the committee as a provisional specification, and that the present committee be continued as a standing committee to keep it up-to-date.

MR. COSTE: The last speaker's motion is out of order. It is not in continuation of what we have done before. It was decided by the former resolution moved by Mr. Kerry that the Council is to appoint these committees and ask them to report to the Council instead of at the Annual Meeting.

THE PRESIDENT: Not that the council is to appoint the committee. The Annual Meeting may appoint any committees it pleases, but they must report to the next Annual Meeting through the Council.

MR. COSTE: My motion was made with that in view, that this report should be treated as any future report will be treated; that this report be referred to Council for any action it sees fit to take.

If Council wants to have it printed and distributed, then we will get it.

THE PRESIDENT: The adoption of our procedure is so new that I had almost forgotten it. We adopted a resolution this morning to the effect that the reports of all committees appointed by the Annual Meeting shall be made to the next Annual Meeting through the Council, with such modifications and directions as the Council may be pleased to attach. Here is the first report coming up after that procedure has been adopted by the Annual Meeting. I think I must rule in view of that, that any other procedure is out of order.

MR. HUNTER: Then I will withdraw my amendment, Mr. President.

MR. LEGRAND: Mr. President, do I understand by what you have said last that the Society cannot do anything this year? Then where are we with that specification?

THE SECRETARY: The Council would be quite in order under the general instruction of the action as proposed by Mr. Coste, to deal with this report as I think Mr. Jameson really wishes it dealt with as a progress report and to send it out, if the Council so acts, to the membership and get their criticism and opinion, so that the progress report may be of value to the membership. Mr. Coste's motion will permit that action and will also, I think, be in harmony with the resolution adopted earlier in the day.

THE PRESIDENT: It does not interfere in any way with the power of this meeting to continue this committee.

MR. LEGRAND: By the resolution we ask the committee to report to the next Annual Meeting. So we cannot do anything this year.

MR. JAMESON: Any motion that will bring this properly before the Society either through the Council or through the Annual Meeting itself is satisfactory to me. We want to make use of it and any way that we consider that we can best get it in that form so that it will be available in the near future will be satisfactory. I am perfectly agreeable to have it brought before the incoming Council and dealt with by them. We have not asked in the report to be continued. I did suggest a standing committee on such subjects as this. It is for the meeting to deal with that. It would be advantageous in the way of getting continuity.

MR. ARMSTRONG: My motion has been put in writing and is "resolved that the report of the committee be received and that the first part of the report as read be taken up in three sections and considered, and that the second part of the report as printed be referred to the Council to have it printed and distributed to the members for discussion and that the Council be authorized to publish it generally as the provisional standard specification of the Canadian Society of Civil Engineers on cement and cement testing."

MR. COSTE: My motion is a very simple one. I move, seconded by Mr. Morris, that the report on Cement be printed, distributed to the members and referred to the incoming Council for action.

THE PRESIDENT: I shall put Mr. Coste's amendment first. You have just heard it. Is it your pleasure that the amendment be adopted?—Carried. That disposes of the main motion, I think. Another question arises, what shall the Annual Meeting do with respect to this Committee on Cement? Shall that committee be continued or shall we adopt the suggestion of the report that a standing committee be formed?

MR. LEGRAND: I move, seconded by Mr. Hunter, that the present Committee on Cement be appointed a standing committee.

MR. COSTE: With the proviso, of course, that the committee does not report to the Annual Meeting.

THE PRESIDENT: That would be understood. I declare the motion carried.

(At one o'clock adjourned to 2.30).

#### AFTERNOON SESSION.

Saturday, 30th January, 3 p.m.

THE PRESIDENT: I have to announce the result of the vote re the sections. That is simply a sort of plebiscite giving the general opinion of the Society on the question of abolishing the four sections and returning to the old system. The vote stood 50 in favour of abolishing the sections and 60 against. A total vote of 110, which is an extremely small vote from the Society on such an important subject. I should interpret the meaning of that to be absolutely nothing. So few have voted and the numbers are so nearly even. It is of no force. It was for the purpose of giving

the Council some information regarding the feeling of the Society, and it seems to give none. You may have a different opinion, but that is the way it strikes me personally. The sections stand as they did before. There was a tendency in the Council to make that change and the Council finally decided to take the opinion of the Society by an open vote. This is the result.

It was decided this morning that the continuation of the discussion re the Usefulness of the Society under several headings here should be deferred until we knew the result of the ballot on the by-laws, because that would settle a number of things. The Secretary tells me that he has not yet been able to get it.

There is one item of business we can deal with meantime, if we will agree to defer it again when the Secretary brings in the report of the by-laws. That is the discussion re the Insurance Fund.

MR. RUST: Has the opinion of any gentleman versed in insurance matters been procured?

THE PRESIDENT: I am not aware of any, Mr. Rust.

MR. LEGRAND: I have had some experience in benevolent societies, and I think in this case we have not a sufficient number to make a successful insurance society. We would need ten or fifteen thousand people. As we are it would be too expensive for each member. It would amount to \$50 or \$60 a year.

MR. MOUNTAIN: The time is not ripe for the Society to go into such a thing.

Moved by Mr. Rust, seconded by Mr. Mountain, that the question of an Insurance Fund be deferred for the present.—Carried.

MR. HUNTER: There was a question left over this morning to be discussed under the transportation report.

MR. MOUNTAIN: That is section 6 on page 36. The continuation of the Committee on Transportation is, I think, an acquiescence in this suggestion. In continuing that committee we are taking part in public matters involving national development, and we have decided on the best way to proceed in order that our action may be forcible. That is, it is to be put through the Council, through the Society, and then it is for the Society to say how much further they will go, whether they will make a memorial to the Government or not. I think that may very well remain.

THE PRESIDENT: Yes, we decided to defer that question and take it up in such a way that it would apply to all sorts of reports as well as the special one mentioned in Section 6.

MR. HUNTER: A motion of Mr. Morris' was deferred.

MR. MORRIS: It was deferred until after the vote on the amendments, I do not see how it hinges on this discussion.

THE PRESIDENT: The amendments to the by-laws proposed by the Council deal with admission to the Society. It is in that way that your motion is deferred.

MR. ARMSTRONG: If there is nothing else before the meeting I might read a resolution that was proposed and it can be considered later. (Mr. Armstrong read a resolution which was afterwards taken up and carried). See page.

THE PRESIDENT: The result of the vote on the amendments to the by-laws is as follows. By-law No. 8, for, 166; against, 47. The majority is more than two-thirds required and the by-law, therefore, is carried.

The next is 13A, down to and including 32 on page 4 of the blue paper. 141 for and 68 against. A majority of over two-thirds, so that those are carried.

The next on the blue paper is No. 27 to 45 inclusive. The vote on that is 135 for and 71 against, so that that set is not carried; there is not the necessary two-thirds majority.

The next is simply a clerical by-law referring to the change of numbers. The vote is 134 for and 62 against. It is carried but it is inoperative and is necessarily inconsistent on account of the failure of the previous set to carry.

Now to omit by-laws 28 and 56 has also been carried.

Then the white list, by-law 37A, for 73, and against 114.

By-law 27; for 68, against 123.

By-law 28; for 68, against 123.

By-law 33; for 72, against 119.

37A, that is apparently repeating the first, but it is marked on this report as the vote referring to what is called here the first part of the second vote. I confess I do not understand it, but the result is 73 for and 117 against. So that none of the by-laws on the white paper have carried.

This report is signed by Edward B. Merrill, D. Blanchard, and N. X. Raymond, scrutineers.

MR. MACPHERSON: May it not be left in the hands of the Secretary to renumber the by-laws consistently?

MR. MITCHELL: Number 28 by-law in our list provides that we shall have an elective Council of a certain number. If we carry that last by-law on the blue list we shall have no officers for the Society in the coming year.

THE PRESIDENT: It has been suggested to me by a member that it will be utterly impossible to settle these things satisfactorily unless the members are allowed to smoke.

We are practically without any by-law governing the Council; the new by-law has not been carried and the old has been omitted. The election of officers is perfectly constitutional, but the very important clause in 27 and also in 28 respecting the number which constitutes a quorum is not now in existence. That I am pretty sure will make trouble in Council.

MR. J. H. HUNTER: Do these by-laws take immediate effect or is it a year afterwards?

THE PRESIDENT: They come into effect for the new Council. The financial year begins in January. By far the best body to settle this matter is the Council. They will take the time and trouble to do it and see that it is made right. I do not think the General Meeting can do anything unless it is within its powers to authorize the Council to do it.

MR. JAMESON: This is a legal matter, and individual opinion will be of very little value just now, and its expression will only take up time. It should be referred to Council.

MR. LEOFRED: Clause 50, on page 15, the three last lines under the title, Amendments to By-laws, says: "The Council may also propose new by-laws or alterations, or repeal all existing by-laws, and may submit the same to vote by letter ballot." That may show you a door to get out of this scrape.

MR. MORRIS: I agree with Mr. Jameson that we are losing time. I suggest that this be left to Council, and that it take the necessary legal opinion on the matter.

MR. LEOFRED: You are not obliged to submit it; you may submit it to vote. You "may" make alterations or repeal all existing by-laws, and you "may" submit, but you are not obliged to. That gives you the margin you want to get out of it.

MR. JAMESON: We must remember that our by-laws are in line with the Quebec Act, and that must be taken into consideration. We can only change them by having them ratified by the Quebec Legislature.

THE PRESIDENT: We have the right to make our changes, and we then go to the Quebec Legislature and get them to act accordingly. Otherwise we shall be hampered by our legislation for ever.

MR. ARMSTRONG: I think your legal adviser will probably tell you that under the General Companies' Act you can carry on your work, but I think the best way is to leave it to your adviser. I move that it is recommended that the Council take legal advice and govern themselves accordingly.

MR. DAWSON: Might it not be well for this meeting to authorize the Council to take whatever steps may be necessary, so that the Council may deal with it, and have the endorsement of this meeting?

Mr. Hunter moved, seconded by Mr. LeGrand, that the incoming Council be authorized to take such steps as are necessary to correct the by-laws in accordance with the wishes of the Association.

MR. COSTE: It may be, Mr. President, that our friend of the legal profession may not find the solution of this very knotty problem. May we not try our hand to-day in annual meeting assembled to settle our difficulty without employing counsel. We know what we want, or at least I think we do, and if there is any procedure in the way of suspending any of the rules at an annual meeting or any of the by-laws, I would wish to see that By-law No. 50, which would practically quash the vote that has been taken by letter; and then it might be in order to put these amendments, as a whole, fresh before the Society for a vote here and carry them. The sense of the Society is evidently that these by-laws should carry. I understand that the clauses from 27 down to 43 were only defeated by a vote of about four. If four members had voted the other way, these by-laws would have been changed in the way it was proposed they should be changed. The vote

on that is a very small vote, and there are certainly four members here who have not voted, and who might possibly vote the right way and carry these by-laws.

MR. LEOFRED: I think the only way to keep out of the law and to do without any lawyer's advice, and without any trouble is for the old Council to hold a meeting, and in that meeting to alter the by-law for a quorum in the way they like, so that the incoming Council then will be sure that the number determined by the old Council for a quorum will be according to law. The Council has a right to make any alteration of quorum or anything.

THE PRESIDENT: But the Council has no power to amend or make by-laws or alterations.

MR. HUNTER: Mr. Chairman, when we want a man to build a bridge we hire an engineer. If we get into a legal difficulty, we hire a lawyer to get us out of it. We have got into a difficulty here and we cannot deny it. Let us vote on the resolution which has been proposed.

MR. MITCHELL: If we are to have legal advice on this, why not have it on the spot and clean it off this afternoon?

MR. COSTE: The new President is quite satisfied with the present arrangement. He is a quorum by himself.

MR. MITCHELL: It is very evident that the members of the Society who voted for or against the by-laws on the blue sheet have been strongly in favor of the principles which have been laid down in the amendments proposed in the blue. It is divided into four parts—four chances to vote for or against this combination. The first was with reference to a thing that is entirely separate from the question that is at issue. The second is partially dependent upon it, but it can stand by itself. The third and fourth are connected. The third, which is the one which has been lost, was lost by three votes evidently. The fourth, which was carried, was carried by five or six votes. The intention evidently is that the two should go together. The question for us to decide is whether those two shall be taken together and carried or not carried.

MR. RUST: That is a legal matter; let us take the vote and leave it to the Council for discussion. The old Council cannot act.

THE PRESIDENT: It is moved by Mr. Hunter, seconded by Mr. LeGrand, that the incoming Council be authorized to deal with the difficulties arising from the omission of by-laws and the inconsistencies resulting from the votes of the Society on the amendments to the by-laws. I declare the motion carried. Now, the questions arising on that. As to the standard of admission to the Society, the amendment has been carried, and we cannot do anything for one year.

MR. MORRIS: This amendment being carried practically excludes the resolution, at least in proposing any alteration in it. The resolution which I proposed does not propose any change in the by-law, but only refers the matter to a committee.

MR. COSTE: That has to be amended in the sense of the former resolution passed this morning, that the report should be made to council and not to the annual meeting.

THE PRESIDENT: Oh, yes; every report now goes to Council and comes to the Society finally in the way provided for this morning.

MR. LEOFRED: If we read the suggestions at page 32 it will be seen that in almost every one of the answers obtained by Council the substance of my friend's motion appears. In approving the motion of my friend I desire to say that I am expressing the feeling of members from all parts of the Dominion who have written to the committee.

THE PRESIDENT: Then I will put Mr. Morris' motion (see page 51). I have counted seven for the motion. I declare the motion lost.

There are some further suggestions in this report of Council that we had to consider after the by-laws. The next was No. 3, on page 36.

MR. MOUNTAIN: I move that this be left as it is, and that neither side be adopted. I do not see any chance of extending it at the present moment to any of the other Provinces. I do not think the legislation is detrimental or should be repealed.

THE PRESIDENT: It is moved by Mr. Mountain, seconded by Mr. McNab, that no action be taken on this motion.—Carried.

That next is, Should the title, Civil Engineer, be controlled by legislation? That will be included, with the consent of the meeting, in Mr. Mountain's resolution.—Carried.

MR. MOUNTAIN: What was done with the eighth, sir?

THE PRESIDENT: No. 8 was simply a question that was submitted to the Society, and they have given a vote on it which practically, I should say, means that they have no decision. Only 110 voted, and 50 were for abolishing the sections and 60 in favor of retaining them. No. 9 is whether more branches should be established, and should these be encouraged further than the present system provides?

MR. RUST: I think that might stand over for the present. We are working very well now in establishing branches. The new branch at Ottawa asked for I suppose will be given the same terms as Toronto was.

MR. LEOFRED: I am on the Executive Committee of the Quebec Branch, and they passed a resolution before I left Quebec to this effect: "Extract from the minutes of the annual meeting of the Quebec Branch, Canadian Society of Civil Engineers, held at the City Hall, Quebec, January 15th, 1909. It was proposed by Mr. A. Leofred, and seconded by Mr. S. S. Oliver, that a by-law should be passed granting the Quebec Branch the rebate of \$2 on all members of the Quebec Branch who reside between Three Rivers and the eastern boundary of the Province of Quebec. Approved. Louis A. Vallee, Chairman; Hugh O'Donnell, Secretary-treasurer." We are not situated as you are in Ontario where you have a great many towns supplying a good number of engineers to make strong branches. In Quebec we are rather isolated, and in order to make a good branch we would like the change proposed.

THE PRESIDENT: Has that question been canvassed among the people interested?

MR. LEOFRED: It was passed at the last meeting of the Quebec Branch, and they asked me to give a copy of this resolution here. There were probably 15 or 20 present at that time, but it reflects the unanimous wish of the Quebec Branch.

Moved by Mr. Jameson, seconded by Mr. McNab, that the request of the Quebec Branch be referred to the incoming Council.—Carried.

Moved by Mr. Rust, seconded by Mr. LeGrand, that the subject of Article 10, page 36, of the Report of Council be referred to the incoming Council.—Carried.

Moved by Mr. Murdoch, seconded by Mr. LeGrand, that No. 7 be also referred to the new Council.

MR. MOUNTAIN: I think No. 7 was brought up this morning. Did I not move a resolution recommending that the name be not changed, and it was carried?

THE PRESIDENT: Yes; I think that is disposed of.

MR. LEOFRED: There was another resolution passed by the Quebec Branch on the same date as the former one. "It was proposed by Mr. A. Leofred, and seconded by Mr. A. R. Decary, to memorialize the Canadian Society of Civil Engineers that it would be very advisable to study the question of establishing a tariff which would be recognized by the courts, similar to the land surveyors, architects, lawyers, notaries, etc. Approved. Louis A. Vallee, Chairman; Hugh O'Donnell, Secretary-treasurer." It is my duty to read this. You may do what you like with it.

Moved by Mr. Coste seconded by Mr. Macpherson, that the above resolution of the Quebec Branch be referred to the incoming Council.

MR. DION: It is said that Mr. Mountain moved that the name of the Society be not changed, and that this was carried. I was under the impression that that was not put. I would not like the incoming Council to understand that it is the sense of the meeting if it is not, and I would like the sense of the meeting to be taken if it has not been taken.

MR. ARMSTRONG: I have a resolution which provides a mode of action for treating the reports of committees to the annual meeting so that their adoption may be facilitated. "Moved by Mr. C. R. Coutlee, seconded by Mr. J. S. Armstrong, that as branches of the Society are rapidly forming in various parts of Canada, all reports of committees appointed at the annual meeting be printed and forwarded to the branches one month before a special meeting of Council, and that the chairman of each branch or other approved delegate be invited to attend that meeting and present a concise statement, voicing the opinions of the members of his branch on all such reports, and that the reports be considered at said meeting of council; and further, the Council is recommended to make reports, recommendations and

draft motions to be presented at the annual meeting of the Society to facilitate the discussions thereat."—Carried.

MR. KERRY: I have a couple of small motions; I do not know whether they will be seconded. The first is, "That the Secretary be instructed to send to the members of the nominating committee a list of the men who have held office in the branches of the Society, because it is the opinion of this meeting that service in a branch is a recommendation for election to the general office of the Society."

Seconded by Mr. Coste and carried.

MR. KERRY: My second motion, Mr. Chairman is "That the Council be directed to transmit all applications for admission to membership or transfer of membership coming from within the district of a recognized branch to the Executive Council of that branch for recommendation before taking final action upon the application."

Seconded by Mr. McNab and carried.

THE PRESIDENT: Votes of thanks have been proposed to our various entertainers as follows:—

The Grand Trunk Railway Company.  
The Railways of the Eastern Passenger Association.  
The University of Toronto.  
The Engineering Society of the University.  
The Engineers Club.  
The Local Committee.  
The Press.

The Canadian Westinghouse Company.  
The International Harvester Company.  
The Canadian Portland Cement Company.  
To our friend Mr. J. A. Jameson.  
The Toronto Street Railway Company.  
The York Springs Mineral Water Company.  
I do not remember, had we any of that?

MR. MCNAB: Before that motion was put with regard to the Toronto Street Railway, may I ask how long these buttons are good for?

THE PRESIDENT: I think they are good for to-day.

Moved by Mr. LeGrand, seconded by Mr. Macpherson, that the thanks of the Society be sent to the various associations and gentlemen mentioned.—Carried.

THE SECRETARY: The scrutineers appointed to count the votes of the nominating committee for 1909 beg to report as follows:—  
Province of Ontario: Total number of ballots received 92. The three members receiving the largest number of votes were Messrs. C. H. Mitchell, C. W. Dill, and T. C. Irving, jr.

Manitoba: 106 ballots, the two members receiving the largest number of votes were L. A. Vallee and C. S. Leech.

The section north-west of Ontario 36 ballots. The two members receiving the largest number of votes were T. E. Schwitzer and H. N. Rattan.

Maritime Provinces: 15 ballots. Member receiving the highest number of votes C. E. W. Dodwell.

Section outside of Canada and Newfoundland: 56 ballots, Henry Holgate.

THE PRESIDENT: The custom, I believe is, simply to adopt the report, and at the same time the member proposing the adoption of the report, unless there is some reason to the contrary, accompanies it with a motion to destroy the ballots. That will not be safe I think in the case of the amendments to the by-laws.

Mr. Jameson moves, seconded by Mr. Macpherson, that the report of the scrutineers be received and that the ballots be destroyed.—Carried.

THE SECRETARY: The report of the scrutineers on the election of officers and members of Council. Number of ballots cast 425. Of these three were not signed, 27 were signed by members in arrears, 15 spoilt, 3 returned blank.

We declare the following elected:—President, Mr. G. A. Mountain, practically unanimously. (Applause.)

Vice-Presidents, W. F. Tye, 271 votes.

H. N. Rattan, 262 votes.

C. J. Desbarats, 195 votes.

For Members of Council, J. E. Schwitzer, 312 votes.

A. E. Doucet, 303 votes.

D. Macpherson, 274 votes.

R. A. Ross, 271 votes.

N. J. Ker, 267 votes.

R. S. Lea, 259 votes.

J. G. Legrand, 257 votes.

F. W. Doane, 253 votes.

— Coultee, 250 votes.

L. A. Vallee, 180 votes.

F. P. Gutelius, 486 votes.

For the General Section, P. Sherwood, 246 votes.

A. St. Laurent, 204 votes.

For the Electric Section, C. H. Mitchell, 248 votes.

L. A. Herat, 224 votes.

Mechanical Section, H. A. Bayfield, 232 votes.

W. Kennedy, jr., 220 votes.

Mining Section, F. L. Wanklyn, 231 votes.

Charles Fergie, 231 votes.

R. W. Leonard, 212 votes.

Signed, J. T. Croft, Chairman.

Moved by Mr. Rust, seconded by Mr. Murdoch, that the report of the scrutineers on the election of officers and councillors be received, and that the ballots be destroyed.

THE PRESIDENT: I shall ask the newly elected President, Mr. Mountain, to take the chair.

PRESIDENT MOUNTAIN: I thank you, gentlemen, for the honour you have conferred on me in electing me to the highest office in the gift of the Society. If spared I will use my best energies for its advancement. (Applause.)

MR. LEOPOLD: Mr. Chairman, I would move, seconded by Mr. Burchell, that a vote of sincere thanks be carried to the retiring President and officers for the very good services rendered the Canadian Society of Civil Engineers in the last year.

MR. BURCHELL: Mr. Chairman, those at a distance have been debarred the privileges of the Society; at the same time we are under very great obligation to the executive officers and the committee workers of the Society. We are unable to carry our share of the burden in that respect, and so it is with feelings of special satisfaction that I have the privilege of seconding this motion. I desire, if you will permit me, to congratulate you, sir, upon your present appointment and to refer in a word to a special feature of your election as President of this Society; namely, your connection with the Railway Commission, of which every engineer may well feel proud. I think that this Commission is an institution that has already accomplished great good and will accomplish very much more in this country. Its work and its possibilities of establishing things on a sound straight basis in railway matters throughout this country should be a subject of very great gratification to every engineer in the country. I personally have in no way subscribed to any political party since I have come back to my native land, and therefore judge of this thing altogether impartially and from the standpoint of one who has watched very closely the workings of similar commissions elsewhere. I feel very proud that Canada has instituted such a commission and has brought into its service such men as we know are connected with it. Therefore, I am peculiarly and specially glad that in this way the Society has recognized the merit of the choice made by the Commission and has elected you, sir, as its President for the year. (Applause.)

THE PRESIDENT: Gentlemen, you have heard the motion moved and seconded, what is your pleasure? I declare it carried.

EX-PRESIDENT GALBRAITH: I am sure the Council, including the late President, feels very grateful at the way this motion has been received. As I said last night, we have left undone a great many things that we ought to have done, but we have tried not to do the things which we ought not to have done. And I thank you all. Before I take my seat I wish to move a resolution. As a member of the late Council I became aware for the first time of the enormous amount of work in the Secretary's office. That work is increasing every year; it is doubling and trebling. The Secretary receives a small douceur, an amount that does not in any way represent the work he is doing. In early days he held together this Society; he has been really the working member of the Council above all others, and I feel it my duty as well as my pleasure to bear witness to the interest he has taken in the Society. I, therefore, move a vote of thanks to our late Secretary, Professor McLeod.

MR. RUST: I have much pleasure in seconding that.

THE PRESIDENT: Gentlemen, you have heard the motion moved by Past-President Galbraith, seconded by Mr. Rust.—Carried. (Applause.)

SECRETARY MCLEOD: I appreciate very highly indeed your kindness in proposing and accepting this vote of thanks. It has always been a very great source of gratification to me that I have been able to do anything in the way of cementing professional engineering in Canada. I may perhaps be permitted to say that I have endeavoured to look upon the work of this Society as the work of a national society, not as the work of a society which is to do a special work for any one section. It seems to me that the profession of civil engineering in Canada is peculiarly fortunate in being in a position to weld together the engineering interests of the different portions of the country. I was reminded in one of the eloquent speeches we heard last night of the connection between the great railways and this Society. As it was so well said by Mr. Macdonald, the railways are the means of promoting the national sentiment in the country, and this Society is a means of promoting a national sentiment and feeling of unanimity and solidarity which cannot be excelled anywhere between the engineers of the east and those of the west. I hope the Society will live to complete its work in a thoroughly satisfactory manner. (Applause.)

MR. LEOFRED: Will anyone make a suggestion as to where the next Annual Meeting is likely to be? I would suggest that it be held in Ottawa.

MR. COSTE: I am afraid that that would be impossible. The meeting is held in the end of January, at a time when the hotel accommodation of Ottawa is taxed to its utmost. The choice, I suppose would remain between the old City of Quebec and the City of Montreal.

MR. LEOFRED: I would suggest, Mr. President, that at the next meeting it might be arranged that the business should be transacted in the first two days and the third day be devoted to the excursion. Some members would prefer to attend the business meeting and then return home.

THE PRESIDENT: The Chair receives these suggestions and will consider them later on.

MR. RUST: I have much pleasure in moving, seconded by Mr. Armstrong, a vote of thanks to the scrutineers for their work.—Carried.

THE PRESIDENT: Before putting the motion to adjourn I would ask that immediately after the adjournment those gentlemen elected to the new Council remain so that we may have an informal meeting.

The Annual Meeting then adjourned.

**THE CANADIAN CEMENT AND CONCRETE ASSOCIATION.**

At the first annual meeting of the Canadian Cement and Concrete Association to be held in Toronto, March 1st to 6th, the following papers will be presented:—

Sanford E. Thompson, Newton Highlands, Mass., "The Selection of Materials for Concrete."

F. A. Norris, Boston, Mass., "Decorative Concrete."

E. G. Perrot, Philadelphia, Pa., "Reinforced Concrete in Building."

Charles D. Watson, Pittsburg, Pa., "Progress in the Manufacture of Cement Products."

C. W. Cadwell, Windsor, Ont., "Twenty Years Experience in Sidewalk Work."

W. J. Frances, Montreal, Que., "Reinforced Concrete."

M. Marssen, C.E. Montreal, Que., "Reinforced Concrete in Europe."

Later there will be published a more complete list.

The total production of iron and steel in Canada in 1908 was 563,672 tons, against 581,146 tons in 1907, a decrease of 17,474 tons, or about 3 per cent. In the first half of 1908 the production amounted to 307,074 tons, and in the second half to 256,598 tons, a decrease of 50,476 tons.

**PLATE GIRDER WEB SPLICES.\***

C. R. Young, B.A.Sc.

Except in the case of plate girders of small size, it is generally impracticable, and sometimes impossible, to construct a girder without one or more web spllices. The rolling mills do not manufacture plates over certain extreme lengths depending upon the width and thickness, and these limits cannot, therefore, be exceeded in size. The price per pound of the extreme sizes of plates is at the same time higher than for those of more moderate dimensions, so that the use of several plates with spllices might be a cheaper arrangement than employing a single plate. It also frequently happens that the necessity for despatch in the work does not permit waiting for the delivery of full-length plates from the mills, and so the girder is made up of shorter ones which chance to be in stock at the time.

The splice provided at a given section must obviously be capable of safely resisting whatever stresses exist in the web at that section under the most unfavorable condition of loading. What this latter is must be ascertained by calculation. In the case of girders carrying moving loads it may chance that the splice will be more heavily stressed under the maximum shear at the section with the corresponding

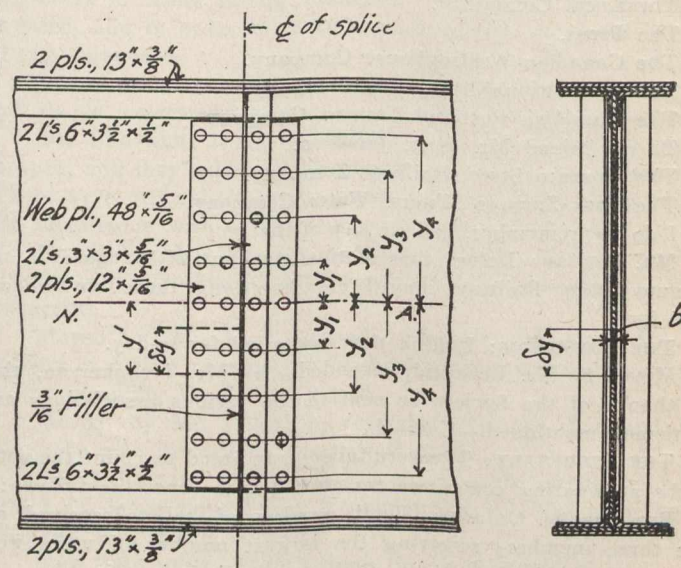


Fig. 1

moment than under the maximum moment with the corresponding shear. This is not likely to occur, however, for spllices nearer the centre of the girder than one-quarter of the span length, and, as will be shown later, the splice will generally be amply strong if designed for the maximum moment sustained by it, without regard to the effect of the corresponding shear. In keeping with the common practice of making the details of a structure such as to develop the full strength of the main material, web spllices are, however, frequently designed to develop the full capacity of the net section of the web, and not merely to resist the calculated stresses that might arise at the joint.

When the arbitrary assumption is made, as some specifications require, that the web is not to be regarded as resisting any of the bending moment, the splice need not be proportioned to take bending stresses, but merely the shear at the section. It then consists, as shown in Fig. 1, of two vertical plates, one on each side of the web, extending from the inside edges of one pair of flange angles to the inside edges of the other pair and having not less than two vertical rows of rivets on each side of the splice. The two plates are generally chosen to make up a combined thickness of one and one-half times to twice the thick-

\* From a paper in Applied Science by Mr. C. R. Young, Lecturer in Applied Mechanics in the Faculty of Engineering, Toronto University.

ness of the web. A pair of stiffener angles are commonly placed at the splice to give effective lateral support.

Although the splice is required to transmit only the vertical shear across the joint, one designed in strict conformity with this requirement would not be allowable since fewer rivets would be employed than practical considerations of rivet spacing will permit. This may be seen from a discussion of the splice illustrated in Fig. 1, which occurs at 12 feet from one end of a girder 40 feet centre to centre of bearings carrying a total static uniform load of 5,000 pounds per lineal foot. The total shear at the joint is 40,000 pounds, and this must be resisted by the two rows of rivets on either side of the splice. The assumption is generally made that this shear is uniformly distributed among the rivets sustaining it, which is probably not far from the truth. In addition to the direct effect of the vertical shear there is a turning moment brought to bear upon the rivets on either side of the joint equal to the vertical shear multiplied by the distance between the centres of gravity of the two groups of rivets on opposite sides of the splice. This arises from the necessarily eccentric application of the vertical shearing force. The effect is not large, however, since the splice generally constitutes a deep connection, and it is generally neglected. Using  $\frac{3}{4}$ -inch rivets and assuming the safe shearing and bearing stresses for rivets at 11,000 and 22,000 pounds per square inch respectively, the least value of one  $\frac{3}{4}$ -inch rivet is found to be 5,160 pounds, its bearing value on the 5-16-inch web plate. The number of rivets required on one side of the splice would, therefore, be  $40,000 \div 5,160 = 8$ . Since, however, the vertical rivet spacing should properly not exceed 16 times the thickness of the splice plates or 5 inches, using 5-16-inch splice plates, 18 rivets must be used on each side of the splice instead of 8. Thus it is necessary, practically, to make the splice much stronger than the requirements of stress-resistance would dictate, in this case almost enough to provide for the total end shear, or in other words, enough to develop the full capacity of the web. The total end shear being 100,000 pounds, and one rivet having a value of 5,160 pounds, only 19 rivets would be required for this service; and, therefore, it is apparent that the splice might as well be at once designed to equal in strength the net section of the web plate.

If in the design of the girder the reasonable assumption is made that the web plate develops the full moment of resistance of which it is capable by virtue of its net area, the web splices must be proportioned to transmit bending, as well as shearing, stresses across the point. Assuming that the bending stress in the web increases uniformly from the neutral axis to the most remote fibre, it follows that the stresses on rivets in a web splice due to bending increase uniformly from zero at the neutral axis to a maximum at the rivet most remote from that axis. The resisting moment which a rivet will, therefore, exert against the bending moment will vary directly as the square of its distance from the neutral axis, since the resisting moment equals the resisting force generated by the rivet multiplied by its distance from the neutral axis. Hence it is evident that the rivets farthest away from the neutral axis are more effective in resisting bending moment than those nearer it, and that those lying on the neutral axis have no value as far as resisting moment is concerned.

For this reason the type of splice shown in Fig. 1 generally proves inadequate where bending stresses have to be provided for, unless a great number of rivets are used by adopting very close vertical spacing or widening the splice plates and introducing another line of rivets on each side of the splice. Such an arrangement is highly uneconomical, for a large proportion of the rivets—those near the neutral axis—have very little value in resisting bending stresses. More efficient means have to be devised, therefore, for splicing webs in girders of the kind under discussion.

A form of splice frequently used in such cases is that shown in Fig. 2, and which has been designed for the girder of Fig. 1, the section of which is revised in conformity with the assumption that one-eighth of the gross area of the web may be considered as flange area. Instead of carrying the

two vertical splice plates from flange to flange, two horizontal splice plates are placed on the web just inside the inner edges of each pair of flange angles and the vertical plates terminate at the inside edges of the horizontal plates. The latter are generally of about the same thickness as the former; that is, the two plates on opposite sides of the web together make up a thickness of one and one-half times to twice the web thickness. By the employment of a splice of this type it is possible to locate a large percentage of the rivets used at a considerable distance from the neutral axis, where they are highly effective in resisting bending moment. So much resisting moment is developed by the rivets in these horizontal splice plates that some designers assume that it is all generated by them, and that the vertical shear is wholly resisted by the rivets in the vertical splice plates, the number of rivets used in these plates being arrived at on the basis of the foregoing assumptions.

While this is an ideally simple arrangement from the standpoint of the designer, it has the disadvantage of giving rise to secondary stresses of considerable magnitude in the web. The provision of a stiff, closely-riveted splice just inside each pair of flange angles has the effect of throwing

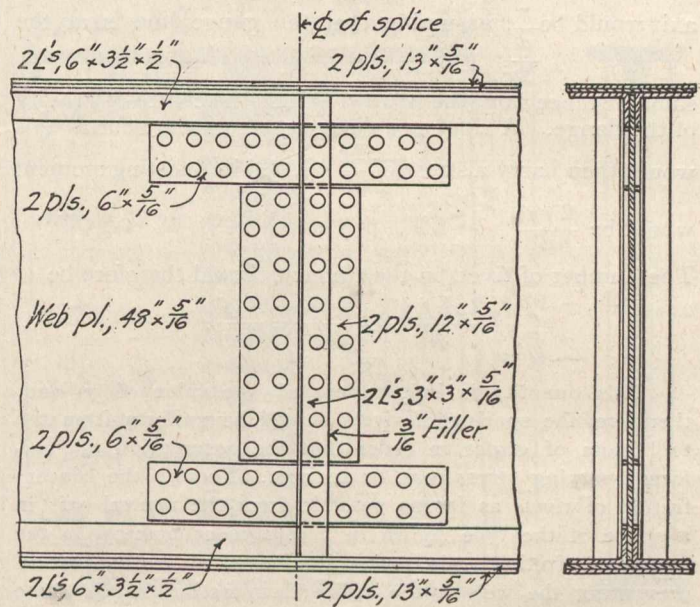


Fig. 2

most of the bending stress into the horizontal splice plates because of the principle that a load which has to travel over several paths divides itself up among these paths directly as their rigidities. This concentration of bending stress into relatively small areas of the web cross-section produces an effect of somewhat the same kind as that which would be produced if single pins were used at the ends of the horizontal splice plates and the web were not reinforced at these points. Such localizing action is evidently not to be commended.

That the concentration of large numbers of rivets at certain points in the web splice is not consistent with the assumption of uniformly-varying bending stresses on the web section may readily be shown. Referring to Fig. 1, the resisting moment of any element of the web of height and thickness  $b$  is equal to

$$\frac{f^1}{y^1} I^1, \text{ where}$$

$f^1$  = the stress in pds. per sq. in. on the extreme fibre of the element.

$y^1$  = the distance from the neutral axis to the extreme fibre of that element.

$I^1$  = moment of inertia of the cross section of the element about the neutral axis of the girder =  $I + Ay^2$ .

$I$  = moment of inertia of cross-section of element about an axis through its own centre of gravity.

$A$  = sectional area of element.

$y$  = distance of centre of gravity of element from neutral axis of girder.

Since the moment of inertia  $I$  of the small area  $A$  about its own gravity axis is negligible compared with the term  $Ay^2$ , we may write  $I^1 = Ay^2$ , approximately. Now since uniform variation of stress has been assumed

$$\frac{f^1}{y^1} = \frac{f}{\frac{d}{2}}$$

where  $f$  = permissible stress at the extreme fibre of the web, which is assumed to be at the centre of gravity of the flange.

$d$  = effective depth of girder which is assumed to be equal to the depth of the web.

The resisting moment of the element therefore equals

$$\frac{2 A f y^2}{d}$$

Now, since the stress on rivets due to bending effect increases directly with the distance from the neutral axis, if a rivet in the gauge line of the flange angles have a safe value of  $r$ , then the greatest permissible stress on a rivet one inch from the neutral

axis would be  $\frac{r}{\frac{d}{2}}$ , assuming that the gauge line is at the

same distance from the neutral axis as the centre of gravity of the flange. A rivet at a distance  $y$  from the neutral axis would then carry a stress of  $\frac{2r}{d} \times y$ , and its resisting moment

would be  $\frac{2 r y^2}{d}$

The number of rivets in the element should therefore be

$$\frac{2 A f y^2}{d} \div \frac{2 r y^2}{d} = \frac{A f}{r}$$

This quantity is independent of the value of  $y$ , and, therefore, the spacing of rivets should be uniform from top to bottom of girder in order that the assumption of uniformly-varying stress may be realized. Though the concentration of rivets as far as possible from the neutral axis in a splice of the type shown in Fig. 2 is economical in the matter of riveting, this saving is effected at the expense of preventing the web at the splice from acting in the same manner as elsewhere, and probably overstressing it at certain points.

This type of splice has at the same time the minor defect of not presenting a very pleasing appearance to the eye. A suggestion of "patching" is borne to one who is not oblivious of all save the requirements of strength and dimension.

A more satisfactory form of splice is that shown in Fig. 3. In this, the vertical splice plates, which are of similar thickness to those used in the types described above, run from flange to flange and horizontal splice plates are put on either side of the vertical legs of the flange angles. The rivets in the vertical splice plates are spaced about four inches apart vertically and as uniformly as possible, the shorter spaces, if any, being placed at the ends. Using two rows of rivets on each side of the splice in these plates is generally not sufficient to develop the full bending value of the web plate, and instead of introducing another row, the horizontal splice plates are employed. If the full value of the web were developed by the rivets in the vertical splice plates, the splice would not be well designed, for the part of the web lying between the two vertical legs of the flange angles should be spliced as well as the part covered by the vertical splice plates. Obviously the horizontal splice plates should be strong enough, and contain enough rivets, to develop the difference of resisting moment of the net section of the web and of the splice as provided by the vertical splice plates and the rivets in them. It might be urged that where more than four rivets were required in the horizontal splice plates on each side of the splice (see Fig. 3) to develop this difference of resisting moment, it is equivalent to concen-

trating the rivets at this point. In answer it can be said that the part of the sectional area of the horizontal splice plates and of the rivets in them which is not utilized for splicing the portion of the web between the vertical legs of the flange angles may be regarded as affording an increment in flange section in the region of the splice. Increasing the flange section at the splice makes it unnecessary to splice the web up to its full bending value, and whatever resisting moment is developed by this increment of flange section need not be provided by the web splice proper.

The objection is sometimes raised against the form of splice under discussion that the horizontal splice plates necessitate additional fillers under the stiffeners which come at the splice or crimping different from that used for the other stiffener angles. These disadvantages are never serious, and are preferable to the use of an arrangement by which only the part of the web between flanges is spliced either by the use of three vertical rows of rivets or two rows and horizontal splice plates on the web with the attendant concentration of rivets near the inner edges of the flange angles. Even if additional fillers have to be used under the stiffener angles at a splice of the form advocated, its superior economy of material and rivets over the splices of the two other forms mentioned above will nearly counterbalance the increase of weight necessitated by the extra fillers. Very often the crimping of the stiffeners at the web splice, if they be crimped, is, or may be made to be, the same as for the other stiffeners. This is possible when the horizontal splice plates can be made of the same thickness as the vertical splice plates, which is frequently the case.

One of the reasons given by some authorities for not using this type of splice is that the rivets in the horizontal splice plates on the vertical legs of the flange angles are put under double duty. Except in the case where the splice occurs at a point of zero shear, a certain number of rivets per lineal inch are required in the flange angles in the region of the splice for the purpose of transferring the increment of flange stress from the web to the flange angles and plates, and, therefore, the rivets in the horizontal splice plates are only partially available for the purposes of the web splice. There is no reason, however, why the rivet spacing in these plates cannot be shortened up, so as to accommodate such a number of rivets, that allowing a part of each rivet for purely flange riveting purposes the requirements in this respect would be fully satisfied while at the same time the remaining parts of rivets would fully provide for the web splice.

To illustrate the method of designing a web splice of the last type discussed, the splice shown in Fig. 3 will be investigated in detail. This joint occurs 15 feet from one end of a girder 60 feet centre to centre of bearings, carrying a total static uniform load of 6,000 pounds per lineal foot. It was figured on the assumption that one-eighth of the gross area of the web acted as flange area, the permissible fibre stress in bending being taken at 16,000 pounds per square inch net section. The safe shearing stress on the web was taken as 10,000 pounds per square inch, net section, the rivets being  $\frac{7}{8}$ -inch in diameter and the assumed safe shearing and bearing stresses being 11,000 and 22,000 pounds per square inch, respectively.

Since, in general, it is not possible to locate a web splice where there is an excess of flange area, the splice will be designed to develop the full bending value of the web. In the present instance it would be permissible to splice the web for only a part of its bending value if the outer cover plates which theoretically terminate about a foot to the right of the joint were carried past that point, as shown dotted in the figure. By this device no excess material is utilized, however, but the flange is reinforced to relieve the web of part of the bending stress. The same results are attainable in a preferable way, by reinforcing the vertical legs of the flange angles. In the problem under discussion the full resisting moment of the web is equal to one-eighth its gross area multiplied by the permissible fibre stress and by the effective depth of the girder which will be



assumed as the depth of the web. This gives  $\frac{3}{8} \times (72 \times \frac{3}{8}) \times 16,000 \times 72 = 3,880,000$  in pounds.

The vertical shear at the section, which is readily found to be 90,000 pounds, must also be transferred across the joint simultaneously with the bending moment. It will be shown, however, that if the splice is capable of withstanding the bending stresses it can resist the shear at the same time without revision of the design.

The most ready method of proportioning the splice is to assume the size of the two vertical splice plates and the arrangement of rivets in them, and then having calculated the resisting moment of these rivets, it becomes an easy matter to ascertain the number of rivets needed in the horizontal splice plates on the flange angles to develop the remainder of the required resisting moment. In the case at hand, the two vertical splice plates will each be assumed as  $13'' \times \frac{3}{8}''$ , and the vertical spacing of the rivets will be chosen as 4 inches, with a few shorter spaces at the ends. The net section of the plates should in all cases be capable of developing the same resisting moment as the rivets connecting them to the web, but this will be realized for ordinary cases if the two plates have a total thickness of about twice the thickness of the web, and the calculation generally need not be made.

The resisting moment of the rivets in the vertical splice plates on one side of the splice may, from what has already

been said, be set down as  $\frac{r}{\frac{1}{2} h^2} \approx y^2$  where

- $r$  = least value of one rivet,
- $h_2$  = distance apart of outside gauge lines in the flange angles,
- $y$  = distance of any rivet from neutral axis.

The least value of one  $\frac{7}{8}$ -inch rivet will be its bearing on the  $\frac{3}{8}$ -inch web plate, or  $\frac{7}{8} \times \frac{3}{8} \times 22,000 = 7,220$  pds., and  $h_2 = 68$  inches. The resisting moment which these rivets can safely develop is therefore

$$= \frac{7220}{34} \times 4 \left\{ (2)^2 + (6)^2 + (10)^2 + \dots + (28.5)^2 \right\}$$

$$= 212 \div 10426 = 2,210,300 \text{ in.} \cdot \text{pds.}$$

The difference between this and the total resisting moment of the web, or 1,677,700 inch-pounds, must be made up by the rivets in the horizontal splice plates. The permissible stress on a rivet at one inch from the neutral axis due to bending being 212 pounds, as determined above, the resisting moment developed by a rivet on the inner and outer gauge lines of the flange angles will be  $212 \times (31.5)^2$  and  $212 \times 34^2$ , respectively. Assuming that  $m$  rivets are required on the inner gauge line and  $n$  on the outer one, we may then equate the resisting moment of these rivets to the balance of resisting moment left undeveloped by the rivets in the vertical splice plates, or

$$2m \times 212 \times (31.5)^2 + 2n \times 212 \times (34)^2 = 1,677,700.$$

Solving by trial it is found that  $m$  and  $n$  in whole numbers must each be equal to 2, these rivets being momentarily regarded as wholly available for the web splice.

The effect of the shear at the splice will now be investigated. Due to bending, the rivets in the outside gauge line of each pair of flange angles will be the ones most severely stressed. At the same time these rivets must resist their share of the vertical shear of 90,000 pounds, which is assumed as uniformly distributed over all the rivets in the two vertical gauge lines on one side of the splice, in this case 36 rivets. The test of the sufficiency of the splice is, therefore, the determination whether the rivets most remote from the neutral axis are capable of withstanding the total stress, from both causes, brought to bear upon them. Since slightly less than two rivets were required in each gauge line of the horizontal splice plates for the development of resisting moment, if two are provided in each gauge line, the stress on the outer rivets need not be as much as the full value of the rivet, but the same proportion of it as the required resisting moment of the splice is to the provided resisting moment. The latter is made up of the resisting moment of the rivets in the vertical splice plates which equals 2,210,300 inch-pounds, and the resisting moment of

the four rivets in the horizontal splice plates which equals  $4 \times 212 \times (31.5)^2 + 4 \times 212 \times (34)^2 = 1,821,700$  inch-pounds. The total provided resisting moment, therefore, equals 4,032,000 inch-pounds, assuming the extreme rivets to be stressed up to their full capacity due to bending alone, and hence the necessary stress on these rivets to develop the

$$\text{required resisting moment is } 7,220 \times \frac{3,888,000}{4,032,000} = 6,950$$

pounds. Combining with this horizontal stress the vertical stress due to shear, which is  $90,000 \div 36 = 2,500$  pounds, we have a resultant stress of  $\sqrt{(6,950)^2 + (2,500)^2} = 7,390$  pounds on any one of the extreme rivets, or an excess of 2.4 per cent. over the permissible stress on a rivet according to the assumed rivet specification. This increase in stress is scarcely large enough to make the addition of another rivet necessary, and the case chosen is fairly representative of the most of web splices. It can generally be said, therefore, that if the splice is designed to provide for bending it will resist the corresponding shear without modification. The only case where revision might be necessary would be where the splice comes near the end of the girder, where it

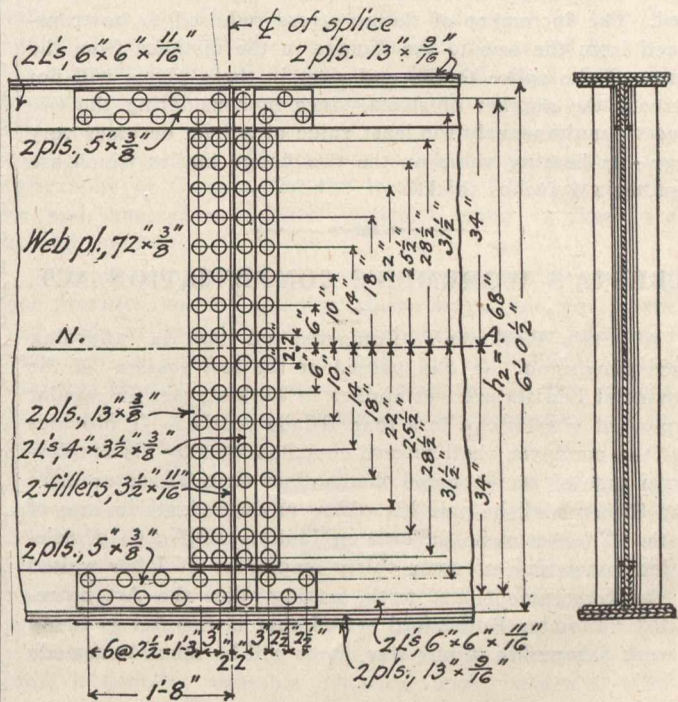


Fig. 3

may have to be designed for maximum shear with the corresponding moment.

Whether the horizontal splice plates on the vertical legs of the flange angles are regarded as web splice-plates or as reinforcements of the flange, they must have sufficient net area to develop the same resisting moment as the rivets in them, it being assumed for the present that all these rivets are wholly available for the purposes of the splice. This resisting moment has been found to be 1,821,700 inch-pounds, and the net area of the two plates multiplied by the permissible fibre stress in them and by the distance between a line midway between the two gauge lines in one flange to the corresponding line in the other flange should be equal or greater than this resisting moment. The permissible fibre stress in these plates will be the permissible stress at

$$32.75 \text{ their centres or } 16,000 \times \frac{32.75}{36} = 14,550 \text{ pounds per square}$$

inch, and the net area of two plates will be  $1,821,700 \div 14,550 \times 65.5 = 1.91$  square inches. Two  $5'' \times \frac{3}{8}''$  plates will be used, giving a net area of 3.00 square inches.

The length of these plates must be chosen so that the rivets in them on the side of the splice nearest the support will be enough to satisfy the requirements of the web splice and at the same time transfer to the flanges the increment

of flange stress which is developed between the last rivet in the plates and the centre of the joint. The result is best arrived at by trial. Assume four extra rivets in the end of these plates, the last rivet coming 20 inches from the centre of the splice. At the splice the spacing for purely flange purposes must be 5.52 inches in the top flange and the same will be adopted for the bottom. Hence, in 20 inches,  $20 \div 5.52 = 3.6$  rivets are needed to transfer the increment of flange stress from the web to the flanges. The four extra rivets will be enough for this purpose, and the four already provided are required for the web splice. The slight excess of 0.4 of a rivet will be required, since the rivet spacing for flange purposes near the end of the horizontal splice plates should be less than 5.52 inches.

On the other side of the splice only enough rivets are required to develop the net strength of the plates, the least value of the rivets being their double shearing value. This is the case since the most direct route for the stress in these plates to follow is from the plates directly into the flange angles and not into the web and then back into the flange angles. The net area of the two plates being 3.0 square inches, and the value of a  $\frac{7}{8}$ -inch rivet in double shear being 13,220 pounds, 3.6 rivets are required. Four rivets will be used. The increment of flange stress required to be transferred from the web to the flanges in the distance from the centre of the splice to the end rivet in these plates will not increase the number of rivets, since in considering the two effects simultaneously the least value of a rivet becomes very large—its bearing value on the two flange angles which are together  $1\frac{3}{8}$  inches thick.

#### ALBERTA'S WORKMEN'S COMPENSATION ACT.

Alberta's Workmen's Compensation Act is affording much discussion. It was passed at the last session of the Provincial Legislature. It applies to working men in regular employ at a salary of less than \$1,200 yearly. It provides that the employee shall receive compensation by his employers in case of accident and that no less than \$1,200 or more than \$1,800 shall be paid his widow or dependents in case of death. The Act came in force on January 1st, 1909. A delegation consisting of some thirty employers of labor waited on the Government last week, asking that the Act be repealed. Premier Rutherford stated that if the Act is found to work a hardship in any way, steps will be taken to remedy it.

The insurance companies are re-issuing insurance upon a new schedule with an increase in rate that is nowhere more than one-half of one per cent. In this schedule the premium is figured on the basis of the employer's pay-roll. The rate for grist mills for a \$10,000 policy is \$1.20 per every \$100 of the pay-roll. Consequently in a mill with a pay-roll of \$20,000 annually it requires only \$240 yearly to insure the employer against liability in case of all accidents.

The representations to the Government made by the employers are interesting. One of the deputation read two resolutions, passed by the Central Employers' Association, condemning the Act as being unfair to employers and entirely in the interest of employees. Another speaker stated he had reduced the number of men in his employ twenty-five per cent. in order that his liability risk will be decreased. This speaker, Mr. W. Humberstone, stated that commercial enterprise will be stifled by the Act, as capitalists will not take the risk of the liability imposed upon them. Attorney-General Cross cited the British Columbia Act in reply to that contention. But Mr. Humberstone argued that the British Columbia Act offers no compensation if it can be shown that the accident is due to negligence of the employee, whereas the Alberta Act does not take that into consideration.

Electric Railway Supplies, Ltd., Toronto, Ont., incorporated, capital \$40,000. Incorporators, S. Johnston, W. N. Tilley, A. J. Thomson, and R. H. Parmenter, all of Toronto.

#### THE RELATIVE COST OF CONCRETE CONSTRUCTION.

Morton C. Tuttle.\*

It will pay the prospective mill owner to remember that the most conservative construction companies claim that a well-built, thoroughly designed concrete mill will probably cost ten to fifteen per cent. more than the same building of mill construction; often the percentage is higher. In figuring a storage building for finished cotton goods we figured on both reinforced concrete and on mill construction with brick walls. As nearly as possible, we figured the same profit on each of the constructions. The figures were \$111,000 for the mill construction, and \$156,000 for the concrete. This was about the comparison of a smaller warehouse which the writer had occasion to estimate upon a year ago. The type of factory building which is most economical to construct of concrete follows very closely the lines which are most economical to construct in timber and brick.

It will nearly always save time to abandon the idea of reinforced mill construction unless the fireproof concrete building is worth more to the owner than the ordinary mill type. The writer is the last who wishes to minimize the advantages of concrete but the material has excellencies enough to stand on its own merits without misleading statements. Remembering the general fact of the cost, the buyer needs to-day to examine carefully the statements made by the concrete construction companies who present the various forms of contract on which they assume no risk of the cost. It is too obvious to need explanation, but there is at least a temptation to minimize the probable expense involved in any particular piece of construction the contract for which the contractor hopes to gain on a guaranteed profit basis. Once the contract is signed, the fact of the general failure to understand the higher cost of reinforced concrete over mill construction alone gives the contractor who also designs the work an incentive to make the design as light as possible in order to bring the costs nearer the owner's expectations. And this leads to a word regarding a few facts concerning design which should be well understood by the buyer of a concrete building.

The first fact is that in a conservative design, the reinforcing metal is good for a working tensile stress of about sixteen thousand pounds per inch of cross section. If there is 16,000 lbs. tensile strain to be taken up, it will require a square inch cross section of steel to take this up with a proper factor of safety whether this steel is in the form of plain bars, of deformed bars, or of mesh. The shape of the metal has but little to do with the fact that so much cross section is absolutely necessary and the buyer should understand that he ties himself up to one company if he agrees to the use of any one patented reinforcement. The best of the designing engineers to-day are laying out their work with plain steel bars of a known cross section, and are prepared to examine any other form of reinforcement which may be offered having an equivalent cross section; and if it proves satisfactory, to accept it; but few of these men are prepared to tie their design down to a specified form of patented bar.

In the buying of a concrete building, the point of most importance is the competence and experience of the men who are to handle the work. An engineer may have full knowledge which will enable him to make a most satisfactory design; if, however, the work is carried out ignorantly, the engineer's assumptions as to strength of concrete and the position of steel may be thrown away by bad handling on the builder's part. The builder of concrete should understand fully the material with which he is working, and understand very clearly the principles used by the designer in laying out his work and the full importance of placing the exact cross section of steel shown in the exact place in which it is located on the plans, and of making the concrete as strong as the engineer has assumed that it will be.

\*Secretary Aberthaw Construction Company, Boston, Mass.

**TORONTO STREET RAILWAY ANNUAL MEETING.**

The seventeenth annual report of the Toronto Street Railway Company has just been issued. This company was incorporated in 1892, and according to the terms of its franchise the company is obliged to make the following payments to the city of Toronto. For each mile of single track \$800 per year, and for each mile of double track \$1,600 per year, and in addition a progressive percentage of the gross receipts of the company as follows:—8 per cent. of the gross receipts until they reach \$1,000,000; 10 per cent. between \$1,000,000 and \$1,500,000; 12 per cent. between \$1,500,000 and \$2,000,000; 15 per cent. between \$2,000,000 and \$3,000,000, and 20 per cent. of all gross receipts over \$3,000,000 in any one year.

The capital stock of the company is \$8,000,000, and on this they paid 7 per cent. dividends for the year 1908. During the same year the gross receipts were \$3,566,493.72, and the maintenance and operating expenses \$1,889,046.62, making the per cent. of the operating expenses to gross earnings 52.9 or 1 per cent. less than last year.

The following comparative statement is of considerable interest, and comparing the percentage of expenses to earning and passengers travelled, will bring out interesting result. One noticeable increase is in the number of transfers collected and also that accompanying an increase of over one million in revenue since 1904, there has been a falling off of almost 6 per cent. in expenses, while with an increase of almost two and a half million since 1898 in revenue, there has been an increase in expense ratio of some 5 per cent.

The company operate 114 miles of track in a city of 350,000 population, and collect on an average 4.001 cents per passenger carried. Fares charged are:—Children, 10 fares for 25 cents; limited hour tickets, 8 for 25 cents; regular, 6 for 25 cents; Sunday tickets, 7 for 25 cents; cash fares, 5 cents; night fares, 10 cents.

**Comparative Statement.**

	1908.	1907.	1904.	1901.	1898.
Gross Income	3,610,274.98	3,511,197.86	2,444,534.24	1,661,917.50	1,210,618.24
Operating Expenses	1,889,046.62	1,893,236.41	1,424,179.54	857,612.16	578,857.26
Net Earnings	1,721,226.36	1,617,961.45	1,020,354.70	803,405.40	631,760.98
Passengers carried	89,139,571	85,574,788	60,127,460	39,848,087	28,710,388
Transfers	32,700,576	31,370,825	20,480,270	13,759,038	9,287,239
Percentage of operating expenses to earnings	52.9	53.9	58.2	51.6	47.4

**SOCIETY NOTES.**

**American Institute of Electrical Engineers, Toronto.**

The Toronto Section of the American Institute of Electrical Engineers met for the regular monthly meeting on January 22nd, in joint session with the Society of Chemical Industry.

Previous to the meeting, forty-three members of the two societies enjoyed an informal luncheon in the St. Charles Cafe, after which at 8 p.m., the meeting was called to order at the Engineers' Club, with seventy-six members present.

Mr. J. C. King, of the Willson Carbide Company, St. Catharines, Ont., presented an original paper entitled "Electro-metallurgical Processes." The paper covered the subject very fully and traced the development of the Electro-metallurgical industry from the very earliest dates. The paper was accompanied by a number of drawings of recent designs in electrical furnaces with a full description of each type and present day practices.

The paper was one of great interest to all present which was demonstrated by the very active discussion which followed the reading of the paper. This discussion being participated in by the following gentlemen; Vice-Chairman Vanderlind, Prof. Lash Miller, Messrs. S. Dushman, Young, E. B. Merrill, Zimmerman, ex-Ald. Thomas Davies, Messrs. F. Smallpiece, E. M. Ashworth, W. Almon Hare, J. E. F. Wyse, W. H. Eisenbeis, Prof. Lang, Prof. Bain, Dr. Ellis, and Dr. Heebner.

**ENGINEER'S LIBRARY**

**BOOK REVIEWS.**

[Books reviewed in these columns may be obtained from the Book Department of the Canadian Engineer.]

**Report of the Mining and Metallurgical Industries of Canada, 1907-8, Issued January, 1909.**

—This report has been issued to meet the increasing demand of the Department of Mines for information on the mining and metallurgical industries of Canada; not only in the Dominion, but from all parts of the world; and at the same time is in compliance with the requirements of "The Geology and Mines Act, 1907," (see introductory statement by Dr. Eugene Haanel, Director of Mines, p. 15). The work comprises 936 pages of text, descriptive of all the metallic and non-metallic mineral mines; and metallurgical and clay industries in the Dominion, from the Atlantic to the Pacific; illustrated by some 144 engravings and drawings, and mineral maps of the respective provinces. The maps alone render the report a valuable acquisition to the desk of every business man in the country; since not only are they up-to-date as regards the topography of Canada, but the locations of known metallic ore and commercial mineral deposits being worked, are marked thereon.

A brief historical sketch prefaces the industrial review of each province, and a description of the magnitude, equipment and mode of operation of every important mine and plant mentioned is given, together with the capitalization and personnel of each organization or company. In the copious index, some 1,500 names of owners, or companies are recorded, alphabetically.

While the report is actually a directory of the mining and mineral industries of the Dominion, it differs from all such hitherto published on the American continent, in the fact that it is not a mere inventory, but has attractive features interesting to everyone engaged in trade and commerce, and eager for the industrial progress of Canada; since in addition to the specification of the many mines and industrial concerns, it contains valuable historical notes, essential geological monographs, analyses of materials, descriptions of equipment, and reliable statistical tables.

The demand for the volume is already large, and promises to exceed the supply. And inasmuch as the production of the report has been costly, the Department has seen fit to publish the work at one dollar, which ensures its getting into the hands of those for whom it is intended, namely, those directly interested in the practical development of the metal and mineral resources of Canada.

Every business man desirous of knowing the extent, magnitude and importance of the mining and metallurgical industries of Canada, should possess a copy of this valuable report; just issued by the Dominion Government, at a time when the country is on the threshold of great industrial development. All communications with regard to the report should be addressed to Dr. Eugene Haanel, Director of Mines, Ottawa.

**The Science Year Book and Diary for 1909.**—Published by King, Sell and Olding, Limited, 27 Chancery Lane, London, W. C. Pages, 400. Size, 6 x 9. Price, \$1.25. Edited by Major B. F. S. Baden-Powell, who is the author of many popular books, this volume contains valuable astronomical, physical and chemical tables, together with a summary of progress in science, by E. Sharpe Grew, which deals generally with astronomy, bacteriology, botany, geography, heredity and physics. One section gives a glossary of recently introduced scientific terms and names, while a useful directory which embraces scientific and technical periodicals, public

institutions and offices, the universities of Great Britain and Ireland and the scientific learned societies of many countries is included. Another section is devoted to a serviceable diary which contains a page for, and information concerning every day in the year. The book is handsomely bound and well indexed. It is an indispensable volume to the science student and expert.—W. M.

**Sewer Construction**,—by Henry N. Ogden, C.E., Associate Member of the American Society of Civil Engineers, Professor of Sanitary Engineering, Cornell University, Special Assistant Engineer, New York State Department of Health. Published by John Wiley & Sons, New York. Price, \$3.

In the preface the author states that the following pages comprise, in a somewhat amplified form a course of lectures given in the College of Civil Engineering, Cornell University. The course is an elective one, intended for students whose purpose to enter the field of Sanitary Engineer, calls for a more special and detailed work than is required of all Civil Engineering students. He also says the course represents the second part of a year's work, of which the book on Sewer Design already published, is the first part, and it is assumed that the reader is familiar with that volume. Wherever serious omissions from the present text have been made on that account, references have been given so that duplication may be avoided. This is just the key-note of the whole book. A book on sewer construction should give some definite information on the subject without depending on another book already written for the knowledge you anticipated in the book purchased.

Chapter I. gives a very good idea of the manufacture of sewer pipes, accompanied with an analysis of the clays used and also a table showing the different standard thicknesses of pipes found to be satisfactory.

In Chapter II. there will be found some very interesting tests on sewer pipe to ascertain their crushing strength. Also a few tables showing the required thickness of pipe based on these experiments. The author deals with the important subject of watertight joints, how they are accomplished with cement and other compositions already in use. The suggestions are worth noting.

Brick sewers are taken up in the following chapter. The subject is very well handled from a descriptive point of view and is well illustrated by cross-sections, applicable to various conditions but lacks detail, both of design and construction. A useful formula is given to guide the engineer as to the required thickness of brick-work for various sized sewers.

Concrete used in sewers construction is attracting more attention than brick, owing chiefly to its relative cheapness. Chapter IV. has a good description of the various methods of constructions aided by numerous cross sections of concrete sewers already constructed. It also contains a number of different compositions of cement, sand and stone, all of which are good construction.

Chapter V. treats with a combination of the preceding two chapters under the head of combined concrete and brick sewers, illustrated by a few cuts. The only real advantage in this combination is that the trench can be filled in immediately after the brick arch has been turned.

Under the heading of reinforced concrete sewers one would naturally expect a detailed mathematical solution of the stresses and how to calculate the thickness of concrete and the amount of steel necessary for the different size sewers. This side of the subject is not touched upon in Chapter VI., which only gives a very scant description assisted by a few cross-sections.

Chapters VII. and VIII. deals with manholes and catch basins. We find a great number of illustrations of both, but as most of them are of standard type, they only serve to give a general idea of their construction.

Chapters IX., X., XI., XII., XIV., and XV. discuss syphon, screens, storm overflows, bellmouth, outfall sewers and house connections respectively. These subjects are exceptionally well described, setting forth their uses and general design. The engineer who is not familiar with the above can get a clear idea of a suitable design for any particular case.

The question, "Foundations of Sewers" is very carefully handled, being illustrated by first-class cuts in Chapter XIII. This important subject is splendidly described and cannot help but convey a lucid idea to the reader.

Surveying for a sewer, as taken up in Chapter XVI. is not a very difficult matter. In the first part of the chapter the inexperienced will find a few useful suggestions, that are carried out during actual construction. The author's page from his field book on giving grades is more confusing than intelligent.

Among the methods mentioned for the location of private drain connections I think, the best and only proper one is the tying in of them from the centres of the manholes.

The economy of sewer work depends largely upon the manner of carrying out the work. Chapter XVII. gives a very good description how to set about it. The first half of the chapter takes up excavation by machine excavators, accompanied by a series of good cuts, while the latter half deals with rock excavation accomplished by explosives.

Chapter XVIII. takes up estimates and costs. Here the engineer will find a first-class guide as to the cost of work, which has been computed from actual construction.

Specifications without loop-holes and will stand the test of experience are very difficult to frame. But in the last chapter of this book you will find a thorough discussion of a set of specifications, that will assist one to avoid loop-holes and also impracticable clauses.—W. R. W.

**The Elements of Railroad Engineering**.—By Wm. G. Raymond. (T. Wiley & Sons, 400 pages, \$3.50). Is one of the latest and best of the many text-books published on the subject of railroad construction. The author, Wm. G. Raymond, is Dean of the Faculty of Applied Science of the State University of Iowa, and stands high in American engineering circles.

In a work of this nature it is impossible to altogether avoid what has already appeared in other textbooks, but the author has succeeded admirably in bringing up-to-date many of the researches inaugurated by the late A. M. Wellington, particularly those relative to locomotive tractive power.

The subject matter is well handled and presented in an orderly manner that will make it very useful as a book of reference. In the introduction the methods of financing modern railroads are well discussed, and the reasons shown for the occasional failure of the enterprise. The author next devotes himself to a description of track standards and it is here particularly that the timeliness of the work shows to advantage. A good description is given of the standard rail sections so recently adopted by the American Society of Civil Engineers. Some time is devoted to a description of the most modern methods of treating ties and their ultimate cost as compared with the untreated ones is well discussed, much of the subject matter being original.

Some space is devoted to modern yards and switches, but as a field book is also being issued; any actual track problems are left to be discussed in it.

There are about a hundred pages devoted to the work of the modern locomotive, and the problems incidental to the use of the virtual profile are thoroughly taken up. One of the best features of the handling of this subject is the series of plates illustrative of practically all the standard types of modern American locomotives. Some time is spent on a full description of the actual work of surveying and constructing the road. It is difficult to add anything to this well covered subject, but a number of the minor details are more fully covered than is usual.

The last portion of the book is devoted to a clear and interesting account of the location of a difficult piece of road through the mountainous districts of Tennessee, and the author need offer no apologies for the inclusion of such an excellent essay in a work of this description.

"Elements of Railroad Engineering" is one of a series of three books on the subject, the other two, "Railroad Field Geometry," and "Railroad Engineers Field Book" being still in preparation. It is one of the best books on the subject published, and should be in the library of every aspiring engineer.—A. C. O.

**The Design of Highway Bridges and the Calculation of Stresses in Bridge Trusses.**—By Milo S. Ketchum, C.E., Dean of the College of Engineering, and Professor of Civil Engineering, University of Colorado. New York: The Engineering News Publishing Company, London, England: Archibald Constable and Company, Limited. Cloth; 6 x 8 $\frac{3}{4}$  ins.; pp. 544; 307 illustrations including a number of folding plates, \$4 net.

Within the past few years a number of timely and useful books have come from the pen of Professor Ketchum, and this one, his latest, is of the same excellent character as its predecessors.

Although much has been written on the subject of bridge design in general and also with particular reference to railway bridges; little has appeared dealing with the special problems of highway bridge engineering. Until the publication of the work under review, no modern text on the subject has been available since Waddell's Design of Ordinary Iron Highway Bridges became obsolete. It is therefore particularly acceptable to those who are making efforts to secure a much better class of highway bridges than have hitherto been built.

The work is divided into three parts comprising twenty-two chapters and an appendix. Part I. deals with Stresses in Steel Bridges, and contains, in addition to a discussion of analytical and graphical methods of arriving at the stresses in beams and trusses, a valuable chapter on Loads and Weights of Highway Bridges, which presents much matter hitherto not generally available to engineers. Diagrams and tables giving the weights of standard highway bridges of various spans and loadings as designed by several different bridge companies are given and will prove of value in preliminary estimates. Several of the diagrams prepared by the Boston Bridge Works were published, however, some years ago in Engineering News. In this part twenty-four useful problems, chiefly devoted to illustrating the methods of calculating the stresses in various types of bridge trusses are solved. In Part II. is given a comprehensive discussion of the Design of Highway Bridges. In addition to descriptions of the structural characteristics of steel highway bridges of various types, the design of plate girders and truss members, and the details of highway bridge members, masonry (including concrete), timber and combination bridges receive attention. Two valuable chapters, contributing much to the usefulness and completeness of the book are devoted to the Design of Abutments and Piers and to Erection; Estimates of Weights, and Costs of Highway Bridges. Part III. is devoted largely to a critical analysis of the design of a typical highway through truss span, the defects in which are indicated at the proper places, and a detailed estimate of weight and cost is presented. The Appendix consists of the author's General Specifications for Steel Highway Bridges.

The author's work has been so well done that little adverse criticism can, in fairness, be made. One, however, is struck with the fact that a good many pages of matter are common to this book and his Design of Steel Mill Buildings, but this fault, if fault it be, chiefly concerns the latter work which was made to include material on bridges, which might well be confined to the former. It may fairly be said, however, that the work under consideration is the only one in English dealing at all comprehensively with the great variety of matters that concern highway bridge design.—C. R. Y.

**High Speed Dynamo Electric Machinery.**—By H. M. Hobart, M. Inst. C.E., M. Am. Inst., E. E. M. Inst. E.E., and A. G. Ellis, Assoc. M. Inst. E.E., Associate City and Guilds of London Institute. Published by John Wiley & Sons, New York. Chapman & Hall, Limited, London, England; cloth, 6 x 9 $\frac{1}{4}$ , pp. 526; 355 illustrations, \$6 net.

The object of the book is a thorough investigation of, "The influence of rated speed on the design of dynamo electric machinery with reference to their use with steam or hydraulic turbines," and as the influence of speed is closely connected with the rated output and pressure, all these three factors are considered in the discussion. The book is divided into three parts; Part I. being entitled, "General considerations," and the discussion is common to both alternating and

direct current machines. In the introductory chapter the authors call attention to the proposition that when not carried to excess, the higher the speed in revolution per minute the more satisfactory will be the results obtained in the design of alternating current generators and the less satisfactory is that of direct current generators, thus for a given rated output the preferable speed will be greater for the former and less for the latter, and that for either some particular output and voltage will give a minimum works cost when designed to operate at some particular speed. The remaining chapters of Part I. deal with design coefficients, as output, weight, and cost, heating and temperature rise with methods—illustrating their measurement and ends with a chapter on the materials of construction, paying special attention to iron, comparing the low loss iron with the ordinary iron used for laminations, giving methods used in the measurement of iron losses.

Part II., entitled "Alternating Current Generators," begins with a chapter on the regulation of alternating current generators, the method of calculating regulation followed is that outlined in one of the author's papers, "Theory of Regulation of Alternators," read before the A.I.E.E., vol. 23, page. 291. The authors then discuss the influence of speed and rated output on the design of alternators, with numerous practical examples, giving analysis of weights and cost. A number of complete designs of several capacities of high speed alternators are worked out in full detail, every detail of dimension, weights, and cost as affected by frequency, speed and output is considered and tabulated, the results being plotted in the form of curves, and it is pointed out that these designs tend to show that the cost and quality of the design do not depend so much on the actual rated speed as on the frequency associated with the speed, from which the authors have drawn conclusions as to the most preferable number of poles for certain outputs and speeds. A noticeable feature is the wealth of useful information which is presented in both tabular and graphical forms, the data being chosen from a large number of machines of different ratings, selected to illustrate the effects of varying the speed. The chapter on the construction of high speed alternators gives descriptions of numerous turbo-alternators of recent design and represents thoroughly both European and American practice. Part II. ends with a chapter dealing with the principle stresses in the rotating field systems of alternators.

Part III., "Continuous Current Generators," under which the continuous current generator is fully discussed along the same general plan as the alternators, special attention being given to the difficulties of commutation. A comparative study of design is made as deduced from a number of preliminary design charts and by successive calculations, the results being plotted together, showing the close agreement of the two methods of design. A chapter is devoted to troublesome ratings and a proposal for their design.

The book presents a valuable addition to the literature on the design of dynamo electric machinery and should be carefully studied by all persons interested directly or indirectly in the design of such apparatus. The conclusions reached by the authors from a study of the numerous examples will be appreciated by the reader, and it will impress him with the nature and extent of the influence of the steam turbine upon the design and construction of dynamo electric machinery. The illustrations are numerous and good showing details of construction of the more recent designs of turbo-generators, a conspicuous feature of the designs described are the devices for producing great stiffness and strength, and for rapid circulation of air in and around the coils and iron. The authors assume that the reader is familiar with the more elementary steps of design and does not intend to teach the art of designing but rather to illustrate the use of design data in drawing general conclusions, and as a basis by which the actual design is evolved.—F. A. G.

**Weight Computer** for sale by the Edge Computer Sales Agency, St. Paul Building, New York. Size, 10 x 10. Price, \$2.00.

This small machine has been designed solely to compute the weights of all structural shapes of any length, and forms a labor-saving appliance for structural engineers, combining

usefulness and simplicity to a value out of proportion to its small cost. It effects these calculations quickly, accurately, without the use of tables and with such simplicity that it is possible for a man without experience to use it.

The machine consists of two discs, one rotating in the other, each disc being marked with logarithmic scales representing the dimensions in feet and inches of the various shapes and results in pounds. The operation of computing the weight of any plate consists in turning the upper disc until the thickness of the plate required (found on the scale marked "for Plates only") corresponds with the required width on the lower disc. The weight of any length of that plate is then seen on the lower disc, opposite the length. The weight of an angle of any length is found by rotating the upper disc until the thickness of the angle (on scale marked "for angles only") corresponds with the number equal to the sum of the two sides of the angle; the weight of any length of that angle is seen opposite that length. Either of these operations entails only one movement of the disc, and results can be found with great rapidity.

The accuracy of the machines is about one-third of one per cent. more than sufficient for all estimating work.

In all structural offices and drawing rooms these calculations have hitherto been a source of much lost time and annoyance. Each separate calculation is easy by pure multiplication or with a slide rule, but a large number of such calculations have to be performed, great care has to be exercised, mistakes are liable and much needless energy, time and money is lost.

### PUBLICATIONS RECEIVED.

The Toronto Bolt and Forging Company send a handsome calendar for 1909, containing a splendid picture of their works at Swansea. Its large clear figures, which are easily seen from a distance, make it especially valuable.

**The Science Year Book for 1909.**—King, Sell & Olding, Limited, 27 Chancery Lane, London, W. C. (Price, \$1.25).

**Principles of Sewage Treatment.**—By Professor Dr. Dunbar, director of the Hamburg State Hygiene Institute. Translated by H. T. Calvert, M.Sc., Ph.D., F.I.C., Chief Chemical Assistant, West Riding of Yorkshire, Rivers Board, with 147 illustrations. Published by Charles Griffin & Company, Limited, Exeter Street, Strand, London, W. C. (Price, 15 shillings). Complete Review will appear later.

The Journal of the American Society of Mechanical Engineers, Vol. 31, No. 1, January, 1909, with supplement, containing the proceedings. 29 West 39th Street, New York.

The supplement to the Journal of the American Society of Mechanical Engineers, for January, 1909, known as the Year Book for 1909. 29 West 39th Street, New York.

**The Geology and Mineral Resources of New Brunswick.**—By R. W. Ellis; Hon. W. Templeman, Minister of Mines, Ottawa.

**Summary Report on Explanations in Nova Scotia, 1907.**—By Hugh Fletcher. Hon. W. Templeman, Minister of Mines, Ottawa.

**Water Power Engineering.**—The theory, investigation and development of water-power, by Daniel W. Mead, Mem. Am. Soc. C.E., Professor of Hydraulic and Sanitary Engineering University of Wisconsin, size, 6 x 9. McGraw Publishing Company, New York. A complete review will appear later.

**Ohio Electric Light Association.**—Proceedings of Fourteenth Annual Convention, held at Put-In-Bay, Ohio, Aug. 25, 26, 27, 1908. D. L. Gaskill, secretary, Greenville, Ohio, U.S.A.

**Quebec Bridge Inquiry, Vol. II.**—Minutes of proceedings of Royal Commission's inquiry, 1907, and printed exhibits. S. E. Dawson, King's Printer, Ottawa.

**Water Pipe and Sewer Discharge Diagrams.** By T. C. Ekin, M. Inst. C.E., etc.; size 9 x 14, contains 25 pages and 3 diagrams; price, 12s. 6d. net. Archibald Constable & Co., Ltd., London, Eng.

**Laboratory Experiments in Metallurgy.** By Albert Sauveur, Professor of Metallurgy and Metallography in Harvard

University; size, 8 x 10; pages 75. Albert Sauveur, Cambridge, Mass., U.S.A.

**Seventeenth Annual Report** of the Ontario Bureau of Mines, 1908, Vol. XVII. Thos. W. Gibson, Deputy-Minister of Mines, Parliament Buildings, Toronto.

**Annual Report** of the Department of Public Works, Province of Saskatchewan, for the year ending February 29th, 1908. Hon. Walter Scott, Commissioner of Public Works, Regina, Sask.

**Thirty-second Annual Report** of the Interstate Commerce Commission, December, 1908. Government Printing Office, Washington, U.S.A.

### CATALOGUES.

**Thermit Repairs.**—A well illustrated booklet is being distributed by the Goldschmidt Thermit Company, 90 West St., New York City, descriptive of repairs to all kinds of heavy steel and wrought iron sections, including motor cases, truck frames, dredge buckets. Descriptions of rail welding and pipe welding are also given.

**Steam Circulation.**—The Webster Modulation System of Steam Circulation is illustrated and described in the catalogue for 1909, of Darling Brothers, Limited, Montreal, Que.

**Valves.**—Messrs. Walch & Wyeth, 87 Lake St., Chicago, have forwarded a booklet which is devoted exclusively to a description of the Enwood Swing Gate Valve.

**Books:**—A catalogue describing scientific books of all kinds is being distributed by the Norman W. Henley Publishing Company, 132 Nassau Street, New York. Copies may be had free of charge on application to the publishers.

**Steam Specialties** and heating apparatus for large factories and public buildings are listed in the catalogue for 1909 of Darling Brothers, Limited, Montreal, Que.

**Foundry Machinery and Equipment** is a booklet which should appeal to the foundryman. It is issued by the Northern Engineering Works, of Detroit, Mich., and includes descriptions of travelling cranes of many kinds. Illustrations of foundry elevators, cupola furnaces and hoists are also given.

**Monthly Stock List.**—Wickes Brothers, of Saginaw, Mich., send a copy of their Monthly Stock List for January, which gives quotations on boilers, engines, dynamos, motors and machinery of all kinds.

**Ball Bearings.**—The New Departure Manufacturing Company, of Bristol, Conn., are distributing a catalogue of two-in-one ball bearings which are claimed to be distinctly new in principle. Descriptions of some length are given and the illustrations are clear.

**Rubber Belt Conveyer.**—A booklet containing many illustrations of the application of rubber belt conveyers for handling materials of various kinds. The Jeffrey Manufacturing Company, Columbus, Ohio.

**Motors.**—Circular No. 1,118, issued by the Canadian Westinghouse Company, Hamilton, Ont., contains a description and numerous illustrations of induction motors and facts regarding each separate part.

**Chain Belt Concrete Mixer.**—The Chain Belt Company, Milwaukee, Wis., have published a pamphlet descriptive of their new chain belt concrete mixer. It also includes an interesting comparison of costs between machine and hand mixed concrete.

**Motor Talks** is the title of a booklet issued by the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., devoted to suggestions for display window advertising.

**Fan System of Heating and Ventilation.**—Is a book which should appeal to architects and engineers. For convenience of reference, it is divided into four sections, two of which deal with heating and ventilating public and industrial buildings, while sections three and four are devoted to the apparatus itself and general data on its application to meet special requirements. The book, which contains a host of original facts and figures, carefully compiled, is being distributed by the Canadian Buffalo Forge Company, 1221-2 Traders' Bank Building, Toronto.

# CONSTRUCTION NEWS SECTION

Readers will confer a great favor by sending in news items from time to time. We are particularly eager to get notes regarding engineering work in hand and projected, contracts awarded, changes in staffs, etc.

Printed forms for the purpose will be furnished upon application.

## TENDERS.

### Ontario.

**HAMILTON.**—Tenders will be received by the undersigned up to 12 o'clock noon of Friday, February 12th inst., for supplying the corporation of Hamilton with sewer pipe, lime, sewer brick and castings (for Board of Works and Sewers Departments only) required during the year 1909. Tenders will also be received up to, but not later than, 12 o'clock noon of Tuesday, February 16th inst., for supplying Portland cement, paving brick, gravel and lumber. S. H. Kent, city clerk.

**OSHAWA.**—Tenders will be received until March 4th, 1909, for the entire capital stock, save certain shares, of the Oshawa Electric Light Company, Limited. This company owns its own steam generating plant and water-power in the town of Oshawa. This company also owns the property and assets of the Bowmanville Electric Light Company, Limited, having steam and water-power generating plant and transmission system in the town of Bowmanville. E. R. C. Clarkson, 33 Scott Street, Toronto.

**OTTAWA.**—Tenders for repairing foundation lock No. 2, Welland Canal, will be received until the 16th February. Address: L. K. Jones, secretary, Department of Railways and Canals, Ottawa.

**OTTAWA.**—Tenders will be received until noon of February 22nd for 144 cedar posts and 113,000 feet best quality spruce timber of various dimensions up to 6 in. x 6 in. and 27 feet long, to be supplied not later than April 8th, 1909. Address: W. W. Cory, Deputy of the Minister of the Interior.

**OTTAWA.**—Tenders for shops, will be received at the office of the Commissioners of the Transcontinental Railway at Ottawa, until 12 o'clock noon, of the 10th day of March, 1909, for the construction and erection complete, in accordance with the plans and specifications of the Commissioners, of shops east of Winnipeg. Plans, details and specifications may be seen at the office of Mr. Hugh D. Lumsden, chief engineer, Ottawa, Ont., and Mr. S. R. Poulin, district engineer, Winnipeg, Man. P. E. Ryan, Secretary.

**SIMCOE.**—Tenders will be received until February 19th for a hot water heating system for the Post Office at Simcoe, Ont. Address: Napoleon Tessier, secretary, Department of Public Works, Ottawa.

**TORONTO.**—Tenders will be received until March 4th, 1909, for the purchase of Stark T.L. & P. System Property, situated in the Counties of York and Peel. E. R. C. Clarkson, receiver, 33 Scott Street.

**WOODSTOCK.**—The building committee of the municipality of Carleton will receive plans, specifications and cost of plans and estimates for the building of a brick Court House in the town of Woodstock during the summer 1909. Said tenders to be addressed to the undersigned. Tenders to be received up to February 20th, 1909. Henry A. Phillips.

### Manitoba.

**WINNIPEG.**—Tenders, addressed to the chairman of the Board of Control, for construction of sewers, will be received until Thursday, February 11th. M. Peterson, secretary, Board of Control office, Winnipeg.

**WINNIPEG.**—Tenders, addressed to the chairman of the Board of Control, for the supply of from 2,500 to 3,500 tons of asphalt for street paving for the city of Winnipeg, will be received until Wednesday, February 24th. M. Peterson, secretary, Board of Control office, Winnipeg.

**WINNIPEG.**—Tenders addressed to the chairman, Board of Control, for supply of ten ton macadam roller for the Street Commissioner's Department, will be received at the

office of the undersigned up to 11 a.m. on Monday, March 1st, 1909. Delivery called for 1st May, 1909. M. Peterson, secretary, Board of Control office.

**WINNIPEG.**—Tenders for supply of from 1,300 to 1,500 tons of soft coal and from 800 to 1,000 cords of jack pine, first quality, delivered to the city asphalt plant, will be received until February 19th. Address: M. Peterson, secretary, Board of Control, Winnipeg.

**WINNIPEG.**—Tenders will be received until March 2nd, 1909, for the supply insulators, supply of material and erection of telephone line, erection of transmission line and certain repair shop equipment. M. Peterson, secretary, Board of Control. (Advertised in The Canadian Engineer.)

### Saskatchewan.

**SASKATOON.**—Tenders will be received until March 1st, 1909, for certain material for waterworks and sewerage works. For details see advertisement. Willis Chipman, C.E., chief engineer, 103 Bay Street, Toronto. (Advertised in The Canadian Engineer.)

**SASKATOON.**—Sealed tenders will be received by the municipality until February 24th, 1909, for a pumping engine with a capacity from 1,200 to 1,500 United States gallons per minute. J. H. Trusdale, Secretary-Treasurer; Willis Chipman, Chief Engineer. (Advertised in the Canadian Engineer.)

### Alberta.

**CALGARY.**—Tenders will be received until February 18th, 1909, for boiler and generators to be supplied to the Commissioners at Calgary. H. E. Gillis, City Clerk. (Advertised in the Canadian Engineer.)

**CALGARY.**—Tenders will be received until February 18th, 1909, for supplying 1,143 tons (approx.) steel rails, together with fasteners; also steel span wire, cedar poles, trolley wire, etc., for street railway. H. E. Gillis, City Clerk. (Advertised in the Canadian Engineer.)

**LETHBRIDGE.**—Tenders will be received until March 1st, 1909, for a Municipal Power Plant at Lethbridge. Fuller particulars will be found in the advertisement in The Canadian Engineer. George W. Robinson, Secretary.

### Foreign.

**ADELAIDE, AUSTRALIA.**—Tenders addressed to the undersigned will be received until April 28th, for the supply of one bucket dredger, one tug, and two hopper barges. Address, Engineer-in-Chief's Department, Adelaide, South Australia.

**BRISBANE, AUSTRALIA.**—Tenders will be received until March 29th for a supply of ironwork, insulators, and iron, bronze and covered wire. Address: Controller of Stores, General Post Office, Brisbane, Australia.

**BRISBANE, AUSTRALIA.**—Tenders will be received until May 31st for installing in the general post office a switchboard, consisting of one trunk line section, three subscribers sections, cable turning and string sections, frames, racks, power plant, etc. Address: Captain R. M. Collins, Australian Commonwealth Offices, 72 Victoria Street, Westminster, S.W., London, England.

**BOSTON, MASS.**—The contract has been let through the office of Charles T. Main, mill engineer and architect, Boston, to the Torrington Building Company, Torrington, Conn., for the new shoe factory for the A. J. Bates Company, Webster, Mass. Plans and specifications are now ready for bidders on the superstructure.

**GUAYAQUIL, ECUADOR.**—Tenders will be received until May 1st for the execution of drainage, water supply, paving, asphaltting and sanitary works at Guayaquil. Ad-

dress: Junta de Canalizacion y Provedora de Agua, Quayaquil, Ecuador.

LA PALOMA, URUGUAY.—Tenders addressed to the undersigned will be received until April 2nd, for the construction of a port. Ministerio de Obras Publicas, Monte Video.

MELBOURNE, AUSTRALIA.—Tenders will be received until March 23rd for the supply and erection of a power plant for the Central Telephone Exchange. Address: Commonwealth Offices, 72 Victoria Street, Westminster, S.W., London, England.

LEIPZIG, GERMANY.—Tenders addressed to the undersigned will be received until March 15th for a supply of pumps for the New Waterworks. Stadtverordneten, Leipzig.

### CONTRACTS AWARDED.

#### Quebec.

MONTREAL.—The Goulds Pump Company have booked an order from the T. Eaton Company, Toronto, for eight triplex electric pumps to operate their elevator plants in Toronto and Winnipeg.

#### Ontario.

TORONTO.—The alternative tenders for brick or concrete sewer construction was opened by the Board of Control. The lowest tender was for concrete construction, \$19.77 per lineal foot, by the Godson Paving and Construction Company. The lowest brick tender was \$33.13, from the Canadian Construction Company (A. M. Orpen). The board decided to hold the checks of the two tenderers in question, \$5,000 each, along with their tenders, and the question of whether the sewer shall be of brick or concrete will not be settled until the English and American sewer experts, who will be in the city soon, report on the matter.

TORONTO.—The Merchant Steamship Company has given a contract to the Sunderland (England) Shipbuilding Company for the construction of a steel vessel to be called the "Mapleton," which will be capable of carrying eighty thousand bushels. The steamer will cost about \$160,000, and will run between Port Arthur and Montreal.

HAMILTON.—The contract for supplying and driving piles at the extension of the Ferguson Avenue and Catherine Street sewers to and through the revetment walls has been awarded to E. A. Fearnside. The contract price is 27 cents per foot, which includes all work.

#### Manitoba.

WINNIPEG.—The tender of G. A. Powell, Winnipeg, was accepted for supplying of 8,000 lbs. of copper and six miles of iron wire for fire alarms and street railway lighting extension. The copper wire is at \$17.85 per 100 pounds, and the iron wire at \$41.45 per mile.

PORTAGE LA PRAIRIE.—The contracts for improvements to Crescent Lake were awarded as follows:—For erection of needle dam and bulkhead on Assiniboine River, William Carr, Portage la Prairie, \$14,000. For canal and earth dam, between Assiniboine River and Crescent Lake, C. P. Wright, of Portage la Prairie, at 15 cents per cubic yard; approximate total \$4,000. For steel and iron work for needle dam, Manitoba Iron Works Company, Winnipeg, for \$534.

#### Saskatchewan.

SASKATOON.—Samuel Brown, of Winnipeg, has been awarded the contract for the erection of the new freight sheds for the Canadian Northern Railway at Saskatoon. The cost is to be \$20,000.

#### Alberta.

EDMONTON.—Tenders were opened for the new machinery required for the power-house extension. Herewith are given the bids on two 400 k.w. generators:—

	Weight	
	Two Machines.	
	lbs.	Price.
Canadian General Electric.....	45,000	\$ 8,500
Northern Electric Company....	50,000	9,250
Allis-Chalmers-Bullock .....	57,000	10,250
Canadian Westinghouse Co....	56,000	9,800
Crocker-Wheeler Company ....	42,000	7,100

All the above machines are quoted f.o.b. Edmonton, freight and duty paid, except the Westinghouse, which is f.o.b. Hamilton. The Crocker-Wheeler tender was accepted.

#### Foreign.

PITTSBURG, PA.—The large order for the complete fuel equipment of the Coronet Phosphate Company, of Coronet, Fla., has been awarded to the Tate, Jones & Co., Inc., Pittsburg, Pa. It consists of "Kirkwood" oil system comprising burners, pumping, heating, and regulating equipment, etc.

### RAILWAYS—STEAM AND ELECTRIC.

#### Quebec.

MONTREAL.—Plans have been submitted to the City Council for the extension and improvement of the Windsor Street station and offices of the C.P.R. When completed, the structure will be one of the most handsome railroad buildings in America. Preparations are also being made for the extension of the Place Viger yards.

#### Ontario.

FORT WILLIAM.—Alex. Bigelow, contractor of the G.T.P., arrived here from Grassie. He states that the weather along the G.T.P. line has been exceptionally severe this winter. Teams conveying the supplies across Sturgeon Lake for the Transcontinental camps are finding considerable trouble in finding the trail.

#### Manitoba.

WINNIPEG.—Improvements to the Winnipeg shops are planned by the Canadian Northern, and on the arrival of spring, work will commence on several additions to the works at Fort Rouge. A carpenter shop, costing \$25,000, will be erected and smaller additions to the present buildings will also be made.

#### Saskatchewan.

MELVILLE.—The G.T.P. will erect additional freight sheds here this spring. They will be 160 feet long. Electrical generators to supply light and power will be installed.

MELVILLE.—Mr. E. J. Chamberlin, the new general manager of the G.T.P. Railway, has arrived here and will arrange the final details of the branch lines to be built to Yorkton and Portal, according to the agreement made with the Saskatchewan Government. Mr. Chamberlin will make an exhaustive tour of inspection over the whole line of route of the G.T.P. Railway from the Great Lakes to Edmonton.

#### Alberta.

EDMONTON.—The question as to whether or not the C.P.R. will enter Edmonton via a high level bridge is becoming more doubtful than ever. It is now learned that the C.P.R. will apply to the Railway Commission, at its sitting here in February, for permission to run its line down Peace Avenue from 10th to 16th Streets and this leads to the belief that the high level bridge plans have been abandoned.

#### Foreign.

DULUTH, MIN.—The annual meeting of the Duluth, Rainy Lake and Winnipeg Railway, was held last week. The Canadian Northern is now in formal control of that company through the election of the new board of directors, the new directors being D. B. Hanna, of Toronto; L. L. Mitchell, and D. J. Morton, of Winnipeg, and W. Ira H. Cook and W. D. Bailey, of Duluth. Mr. Hanna is the third vice-president of the Canadian Northern and Messrs. Morton and Mitchell are also Canadian Northern directors.

### LIGHT, HEAT, AND POWER.

#### Ontario.

KINGSTON.—The municipal Light, Heat & Power plant, notwithstanding a large reduction in rates a year ago, came through the year with a surplus of \$4,500, and the people are more than satisfied.

CAMPBELLFORD.—The Seymour Power & Electric Company, Limited, is placing contracts for the construction of a power-house here. When complete it will develop 4,000



horse-power, and contracts for the more important machinery have already been made with The Canadian Westinghouse Manufacturing Company, The Canadian General Electric Company, Wm. Kennedy & Sons, and The General Electric Company of Sweden. Smith, Kerry and Chace, Toronto, engineer-in-charge.

#### British Columbia.

**KAMLOOPS.**—H. K. Dutcher, of Cleveland, and Dutcher, Vancouver, B.C., have been engaged by the city of Kamloops to make a report on a scheme for reorganizing the municipal electric lighting and pumping plant.

#### Foreign.

**MEXICO CITY.**—The Mexican Light & Power Company is preparing to increase its plant from 50,000 to 124,000 horse-power, and to accomplish this will construct 30 kilometres of canals and tunnels to bring water into use from rivers now untouched. Other improvements will be made.

### SEWERAGE AND WATERWORKS.

#### Nova Scotia.

**DOMINION, C.B.**—At a meeting of the ratepayers, held on January 29th, the Town Council was authorized to borrow \$20,000 for the installation of a permanent water supply to cost \$16,000. The water will be supplied by the town of Glace Bay from their sandpipe at Cadegan's brook.

#### Alberta.

**EDMONTON.**—Frank M. Gray appeared before the City Council Committee and outlined the scheme he is promoting to supply the city of Edmonton with water piped from Pigeon Lake, which is 45 miles southwest of the city, and due west from Wetaskiwin. He proposes to sell water to the city for 7 cents per 100 cubic feet. Pigeon Lake has an area of 37 square miles. It has a catchment area of 106 square miles. Its average depth is 36 feet. Its elevation is 597 feet above Edmonton. By Mr. Gray's scheme it is proposed to install a 33-inch pipe line to Edmonton, with two reservoirs, one at Wizard Lake, which is a few miles north of Pigeon Lake, and another reservoir five and a half miles outside of the limits of Edmonton. The pressure from Pigeon to the service reservoir is 260 pounds per square inch. The pressure from the reservoir into the city mains is 104 pounds per square inch. This latter pressure the present system of mains laid in the city, could stand, but to use the direct pressure of 260 pounds would require the installation of high pressure mains in the city.

### TELEPHONY

#### Ontario.

**ST. THOMAS.**—The Bell Telephone Company of this city has signed an agreement with the Yarmouth Rural Telephone Company that as soon as the latter line is erected to the city limits a connection will be made with its switch board, which, it is supposed will be placed in Yarmouth Centre. By this means the subscribers of each line may carry on a conversation with one another on the interchange basis. Each company will do the switching for the other, the charges to be the same in both cases.

**TILBURY.**—The Tilbury Council have granted a franchise to the Tilbury Telephone Company, Ltd., to use the streets for a period of twenty years. The maximum price of telephones on this line is not to exceed \$12 per year.

**TORONTO.**—A telephone system will be built by the Hydro Electric Commission along the public highway, paralleling the course of the power transmission line and with points at every mile where connections may be made. This is to ensure facility for the linemen in communicating with the nearest sub-station in cases of accident.

**TORONTO.**—Under the management of Mr. M. S. Pierce the Northern Electric and Manufacturing Company, Ltd., of Montreal, have opened a branch at 62 Front Street West, Toronto. The company will therefore be able to handle promptly all business in Ontario, as the Toronto

## THE MANITOBA IRON WORKS

LIMITED

### WINNIPEG

**STEEL and IRON for MUNICIPAL WORKS,---BRIDGES, BUILDINGS, ROOF TRUSSES, SEWER MANHOLE CASTINGS, WATER PIPE SPECIALS, etc.**

**CONTRACTORS' SUPPLIES--- Steam Hoisting Engines, Derricks, Pile Hammers, Pile Shoes, etc.**

WRITE FOR MONTHLY STOCK LIST OF

**Beams, Angles, Channels, Plates and Bars.**

branch will extend its operations west of Belleville to the Soo. They have also been appointed Ontario agents for the Wire and Cable Company of Montreal.

#### Manitoba.

**WINNIPEG.**—The Provincial Government has decided to abolish the Department of Telephones, and to concentrate the administration of the system entirely with the commission. Deputy Minister French has been relieved of office and will join the staff of an American concern.

#### Saskatchewan.

**REGINA.**—No contract for telephone poles is being entered into. Hon J. A. Calder states that last year the Government bought 410 miles of poles, and only half of these are delivered yet. In the House he stated that negotiations had been opened for the purchase of a system and the Bell Company had made an offer. Nothing definite had been decided yet, but he would open negotiations again shortly.

**REGINA.**—With a proposed capital stock of one million dollars, divided into shares of one hundred dollars each, "The Farmers' Railroad Company" is seeking incorporation at the present session of the Legislature. The provisional directors are David W. Hines, George W. Mollison, J. W. Hines, William Montgomery and James Balfour, and the main object of the company as set out in the Bill now before the Legislature is to construct and operate the following lines of railway: (a) From Regina north along the west side of Last Mountain Lake to a point at or near Humboldt and from thence to a point at or near Melfort. (b) From a point at or near Melfort in a northerly direction along Carrot River to the eastern boundary of the Province. (c) From a point at or near Humboldt to Saskatoon. (e) From Saskatoon south-westerly to the western side of the Province. (f) From a point at or near the south end of Last Mountain Lake to Moose Jaw south to the International boundary line. The head office of the company is to be located at Regina.

## MISCELLANEOUS.

## Ontario

**KINGSTON.**—The City Council has given the Canadian Locomotive Company a lease of property on Earl Street for building shops, and work will commence in the spring.

**OTTAWA.**—A deputation from the Engineers' Club of Toronto waited upon Sir Wilfrid Laurier on Jan. 29 and asked for the appointment of Canadian engineers upon the Quebec Bridge Commission. The deputation which was introduced by Mr. Hugh Guthrie, M.P., was composed of Messrs. A. B. Barry, president; R. B. Wolsey, secretary; John Fielding, Claude Macdonell, M.P., John Tolmie, M.P., and J. G. Sing, Chief Engineer of Public Works, Toronto.

**OTTAWA.**—The final report of the Georgian Bay Canal Commission has been placed before Parliament. In the main this has been discounted by a preliminary report which appeared last session. Some additional details, however, appear. It has already been noted that the cost will be \$100,000,000, and the additional information is vouchsafed that the annual cost of maintenance will be \$900,000. The plan advocated is to have the summit level above Lake Nipissing. To use Lake Nipissing as the summit level would cost an additional \$100,000,000 at least, and introduce twelve additional miles of canal cutting. The water supply conditions are satisfactory. Appended is a recommendation as to forest conservation. The report says: "A commission should examine the great canals of the world."

**PORT ARTHUR.**—Competitive plans are invited for a Collegiate Building, to be erected in Port Arthur, on the present site of the High School. Total cost \$60,000. Allowing \$15,000 for gymnasium, heating, plumbing, ventilation and equipment. Plans to be submitted not later than February 20th, 1909. J. W. Morgan, secretary-treasurer of the Board.

## Alberta.

**CALGARY.**—Mr. F. P. Aylwin, C.E., of Ottawa, is to carry out a large irrigation scheme near Calgary. The scheme affects nearly seventy thousand acres, and water is to be diverted from the Daw River. The estimated cost is \$500,000.

## British Columbia.

**PRINCE RUPERT.**—Owing to a reduction in wages paid by the Grand Trunk Pacific the work of surveying the townsite has been brought to a standstill. Transitmen have been paid \$100 and chainmen \$45 per month with board. Some weeks ago notice was sent out by the officials of the company that the wages would be cut to \$75 for transitmen and \$35 for chainmen on January 1, and on Jan. 9th the 100 men employed all quit work with the exception of half a dozen, who it is reported have been kept on at the old rate of pay. Considerable dissatisfaction is felt, the men claiming the move is a violation of the agreement made between the Grand Trunk Pacific and the Provincial Government, who are paying one-fourth of the expenses of surveying the townsite; and they also maintain that the former rate is the current wage paid for this class of work in the district.

**VANCOUVER.**—Surveys are to be begun in a few days of Vancouver harbor with a view of making improvements to safeguard navigation. It is proposed among other things to make some improvements in the Vancouver narrows and to erect semaphores at Prospect Point and Brockton Point to be used in making signals to warn mariners when steamers or other craft are entering the narrows from either end, and in this way make the navigation of the entrance more safe than it is at present. The surveyors appointed for the work will make a thorough survey of the harbor and report with regard to the work necessary for its improvement. It is proposed to do considerable dredging in the narrows and mark a channel with buoys.

## CURRENT NEWS.

## Quebec.

**MONTREAL.**—The Mexican Northern Power Company has been organized here. The directors are: G. F. Greenwood, C.E., president; E. B. Greenshields, vice-president; Edmund Hanson, S. J. Moore, J. D. Paterson, S. M. Brookfield and Hon. B. F. Pearson, M.P.P. Frank Thompson is secretary of the company, and W. F. Tye is general manager and chief engineer.

## SOCIETY NOTES.

## Association of Manitoba Land Surveyors

At the annual general meeting of this Association, held on Wednesday, January, 20th, the following officers were elected: President George McPhillips; vice-president, L. S. Vaughan; secretary-treasurer, C. C. Chataway; members of council (for two years), G. A. Bayne, and W. B. Young; auditors, G. B. McColl and A. R. Davis.

## Alberta Association of Architects.

The third annual meeting of the Alberta Association of Architects was held in Edmonton on January 29th and 30th. The officers elected were: Hon. President, James E. White, Edmonton; president, R. Percy Barnes, Edmonton; first vice-president, James A. Macdonald, Lethbridge; secretary, H. M. Widdington, Strathcona; treasurer, James Henderson, Edmonton; council, W. S. Bates, Calgary; H. D. Johnson, Edmonton; J. Llewellyn Wilson, Calgary; C. Lionel Gibes, Edmonton; Roland W. Lines, Edmonton; James E. Wise, Edmonton. It was decided to recommend an amendment to the Mechanics' Lien Act.

# PEERLESS

The Fence that saves Expense

**PEERLESS**  
The Fence that Saves Expense

Because it saves repairs. It does not sag, bag, snap or break, and when once put up it stays in good shape. Adjusts itself to all irregularities of the ground and resists weather—wear and stock especially well. Makes the best railroad fence you can possibly put up, both in appearance and lasting qualities. You can do no better than to erect Peerless Fencing. It will always be a standing example of your good judgment. The Free Book we are sending out is very interesting to people in your field. Shall we send you a copy—a postal request will bring one promptly.

**THE BANWELL HOXIE WIRE FENCE CO.,**

Dept. 15 Ltd.

HAMILTON, Ont. WINNIPEG Man.

# STRONGER

Than Stock-Weather and Wear

MARKET CONDITIONS.

Toronto, February 11th, 1909.

Roofing felt, building paper, pitch and tar, which have been extremely depressed, are finding more enquiry and even definite orders for April and May delivery. Bricks are moving in only small quantities, and cement is as dull as usual, with good prospects, however, of wholesale activity when navigation opens. Lumber, as described in last week's review.

Nothing worth while seems to have come of the flurry in copper and tin last week. The London speculation for an advance in copper has apparently failed, and as to tin all that can be said is that it is firmer in distant markets. Lead is quiet and zinc unchanged. Demand for iron and steel structural goods is quiet, and prices do not appear to have altered. Structural steel is almost stagnant in the States.

The consumers of pig-iron in Britain have had a trying year in 1908, and even yet there is not much activity. The consumption is enormously decreased compared with a year or even two years ago. Scotch iron production shows a decline of 173,256 tons; Cleveland, 282,000 tons; West Coast, 292,583 tons, as compared with 1897. Shipbuilding, too, has suffered from a bad year. The output of British yards was only 1,076,562 last year, where in 1907 it was close upon two millions.

The following are wholesale prices for Toronto, where not otherwise explained, although for broken quantities higher prices are quoted:—

**Antimony.**—Partakes somewhat of the greater strength that characterizes all metals this week. Not much selling, however. Price as before, 93-4c.

**Axes.**—Standard makes, double bitted, \$8 to \$10; single bitted, per dozen, \$7 to \$9.

**Boiler Plates.**—1-4 inch and heavier, \$2.40. Boiler heads 25c. per 100 pounds advance on plate.

**Boiler Tubes.**—Orders continue active. Lap-welded, steel, 1 1/4-inch, 10c.; 1 1/2-inch, 9c. per foot; 2-inch, \$8.75; 2 1/4-inch, \$10; 2 1/2-inch, \$10.60; 3-inch, \$12.10; 3 1/2-inch, \$15; 4-inch, \$18.50 to \$19 per 100 feet.

**Building Paper.**—Plain, 30c per roll; tarred, 40c. per roll. Business seasonably quiet.

**Bricks.**—Common structural, \$9 per thousand, wholesale, and the demand moderately active. Red and buff pressed are worth, delivered, \$18; at works, \$17.

**Cement.**—Price in 1,000-barrel lots \$1.70 per barrel, including bags, or \$1.30 without bags. Smaller quantities, \$1.80 to \$1.90. Very little movement at present, but a more hopeful feeling for spring.

**Coal Tar.**—Nothing doing, price maintained at \$3.50 per barrel.

**Copper Ingot.**—We do not change our quotation from 15c. to 15 1/2-c. Matters have quieted down, and there is but slight movement at unchanged prices.

**Detonator Caps.**—75c. to \$1 per 100; case lots, 75c. per 100; broken quantities, \$1.

**Dynamite,** per pound, 21 to 25c., as to quantity.

**Roofing Felt.** Very limited request. Price \$1.80 per 100 pounds.

**Fire Bricks.**—English and Scotch, \$30 to \$35; American, \$27.50 to \$35 per 1,000. Moderate demand and fair supply.

**Fuses—Electric Blasting.**—Double strength, per 100, 4 feet, \$4.50; 6 feet, \$5; 8 feet, \$5.50; 10 feet, \$6. Single strength, 4 feet, \$3.50; 6 feet, \$4; 8 feet, \$4.50, 10 feet, \$5. Bennett's double tape fuse, \$6 per 1,000 feet.

**Galvanized Sheets—Apollo Brand.**—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, \$3.05; 12-14-gauge, \$3.15; 16, 18, 20, \$3.35; 22-24, \$3.50; 26, \$3.75; 28, \$4.20; 29, \$4.30; 10 1/4, \$4.50 per 100 pounds. Fleur de Lis—28-gauge, \$4.30; 26-gauge, \$4.05; 22-24-gauge, \$3.50. Queen's Head—28-gauge, \$4.50; 26-gauge, \$4.25. Sheets are in very active request.

**Iron Chain.**—1/4-inch, \$5.75; 5/16-inch, \$5.15; 3/8-inch, \$4.15; 7/16-inch, \$3.95; 1/2-inch, \$3.75; 9/16-inch, \$3.70; 5/8-inch, \$3.55; 3/4-inch, \$3.45; 7/8-inch, \$3.40; 1-inch, \$3.40.

**Bar Iron.**—\$1.95 to \$2, base, from stock to wholesale dealer.

**Iron Pipe.**—Black, 1/4-inch, \$2.03; 3/8-inch, \$2.25; 1/2-inch, \$2.63; 3/4-inch, \$3.50; 1-inch, \$5.11; 1 1/4-inch, \$6.97; 1 1/2-inch, \$8.37; 2-inch, \$11.16; 2 1/2-inch, \$17.82; 3-inch, \$23.40; 3 1/2-inch, \$29.45; 4-inch, \$33.48; 4 1/2-inch, \$38, 5-inch, \$43.50; 6-inch, \$56. Galvanized, 1/4-inch, \$2.86; 3/8-inch, \$3.08; 1/2-inch, \$3.48; 3/4-inch, \$4.71; 1-inch, \$6.76; 1 1/4-inch, \$9.22; 1 1/2-inch, \$11.07; 2-inch, \$14.76. Makers are holding prices stiff.

**Lead.**—Quiet and unchanged at \$3.90 to \$4.00 here. Excitement abroad quieted.

**Lime.**—In adequate supply and slow movement. Price for large lots at kilns outside city 22c. per 100 lbs. f.o.b. cars; Toronto retail price 35c. per 100 lbs. f.o.b. car.

**Lumber.**—We quote dressing pine \$32 to \$35 per thousand; common stock boards higher at \$26 to \$30.00; cull stocks, \$20; sidings, \$17.50. Norway pine is neglected in favor of Southern, which is much stronger in fibre and the price well maintained. Hemlock continues to sell pretty freely, and in car lots brings \$16.50 to \$17.00. Spruce flooring is quoted at \$22.00 in car lots. The season being practically over for shingles, there is but little movement in them, and prices are weak though unchanged at \$3.20 for British Columbia. White pine lath are scarcer, No. 1 especially, we quote \$4 for No. 1 and \$3.50 for No. 2 firm. More spruce and hemlock have moved than pine. Prices are maintained all over the list.

**Nails.**—Wire, \$2.55 base; cut, \$2.70; spikes, \$3. There is a fair supply and no special activity.

**Pitch.**—Very quiet; price, 70c. per 100 lbs.

**Pig Iron.**—Business continues quiet; prices are fairly well maintained. Clarence quotes at \$20.50 for No. 3; Cleveland, \$20.50 to \$21.00; in Canadian pig, Hamilton quotes \$19.50 to \$20.

**Plaster of Paris.**—Calced, wholesale, \$2; retail, \$2.15. Trade quiet.

**Putty.**—In bladders, strictly pure, per 100 lbs., \$2.25; in barrel lots, \$2.05.

**Rope.**—Sisal, 9/16c. per lb.; pure Manila, 12 1/4c., Base Sewer Pipe.—

	4-in.	6-in.	9-in.	10-in.	12-in.	24-in.
Straight pipe per foot	\$.20	\$0.30	\$0.60	\$0.75	\$1.00	\$3.25
Single junction, 1 or 2 feet long	.90	1.35	2.70	3.40	4.50	14.63
Double junctions	1.50	2.50	5.00	....	8.50	....
Increases and reducers	....	1.50	2.50	....	4.00	....
P. traps	2.00	3.50	7.50	....	15.00	....
H. H. traps	2.50	4.00	8.00	....	15.00	....

In steady demand; price 70 per cent. off list at factory for car-load lots; 60 per cent. off list retail.

**Steel Beams and Channels.**—Quiet. We quote:—\$2.50 to \$2.75, according to size and quantity; if cut, \$2.75 to \$3; angles, 1 1/4 by 3-16 and larger, \$2.50; tees, \$2.80 to \$3 per 100 pounds. Extra for smaller sizes of angles and tees.

**Steel Rails.**—80-lb., \$35 to \$38 per ton. The following are prices per gross ton, for 500 tons or over: Montreal, 12-lb., \$45; 16-lb., \$44, 25 and 30-lb., \$43.

**Sheet Steel.**—Market steady, with fairly good demand; 10-gauge, \$2.50; 12-gauge, \$2.55; American Bessemer, 14-gauge, \$2.35; 17, 18, and 20-gauge, \$2.45; 22 and 24-gauge, \$2.50; 26-gauge, \$2.65; 28-gauge, \$2.85.

# Bar Steel

IRON FINISH      SMOOTH FINISH

## REEL ED

At low prices for satisfactory qualities

### A. C. LESLIE & CO., Limited

MONTREAL

**Tool Steel.**—Jowett's special pink label, 10 1/2c. Cyclops, 16c.  
**Tin.**—The tone of outside markets is firmer, some authorities still think the price must go up. The production has increased. No change in price here, 30 to 31c.

**Wheelbarrows.**—Navy, steel wheel, Jewel pattern, knocked down, \$21.35 per dozen; set up, \$22.35. Pan Canadian, navy, steel tray, steel wheel, per dozen, \$3.30 each; Pan American, steel tray, steel wheel, \$4.25 each.

**Zinc Spelter.**—Business fairly active, market strong at \$5.25 to \$5.50, and more enquiry.

\* \* \* \*

Montreal, February 10th, 1909.

**Antimony.**—The market is steady at 0 to 9 1/2.

**Bar Iron and Steel.**—Prices are steady all round, and trade is dull. Bar iron, \$1.90 per 100 pounds; best refined horseshoe, \$2.15; forged iron, \$2.05; mild steel, \$2.00; sleigh shoe steel, \$1.90 for 1 x 3/4-base; tire steel, \$1.95 for 1 x 3/4-base; toe calk steel, \$2.40; machine steel, iron finish, \$2.10; smooth finish, \$2.75.

**Boiler Tubes.**—The market is steady, quotations being as follows:—2-inch tubes, 8 1/2c.; 2 1/2-inch, 10c.; 3-inch, 11 1/2c.; 3 1/2-inch, 14 1/4c.; 4-inch, 19c.

**Building Paper.**—Tar paper, 7, 10, or 16 ounce, \$1.60 per 100 pounds; felt paper, \$2.40 per 100 pounds; tar sheathing, No. 1, 55c. per roll of 400 square feet; No. 2, 35c.; dry sheathing, No. 1, 45c. per roll of 400 square feet, No. 2, 28c. (See Roofing; also Tar and Pitch).

**Cement.**—Quotations are for car lots, f.o.b., Montreal. Canadian cement is \$1.55 to \$1.65 per 350-lb. bbl., in 4 cotton bags, adding 10c. for each bag. Good bags re-purchased at 10c. each. Paper bags cost 2 1/2c. extra, or 10c. per bbl. weight. English cement is \$1.65 to \$1.85 per 350-lb. bbl. in 4 jute sacks (for which add 8c. each) and \$2.20 to \$2.40 in wood. Belgian cement is \$1.60 to \$1.65 in bags—bags extra—and \$2.10 in wood.

**Chain.**—The market is steady as follows:—3/4-inch, \$5.30; 5-16-inch, \$4.05; 3/8-inch, \$3.05; 7-16-inch, \$3.45; 1/2-inch, \$3.20; 9-16-inch, \$3.15; 5/8-inch, \$3.05; 3/4-inch, \$3; 7/8-inch, \$2.95; 1 inch, \$2.95.

**Copper.**—The market is steady at 15 to 15 1/4c. per lb. Demand continues limited.

**Explosives and Accessories.**—Dynamite, 50-lb. cases, 40 per cent. proof, 18c. in single case lots, Montreal. Blasting powder, 25-lb. kegs, \$2.25 per keg. Special quotations on large lots of dynamite and powder. Detonator caps, case lots, containing 10,000, 75c. per 100; broken lots, \$1. Electric blasting apparatus:—Batteries, 1 to 10 holes, \$15; 1 to 20 holes, \$25; 1 to 30 holes, \$35; 1 to 40 holes, \$50. Wire, leading, 1c. per foot; connecting, 50c. per lb. Fuses, platinum, single strength, per 100 fuses:—4-ft. wires, \$3.50; 6-ft. wires, \$4; 8-ft. wires, \$4.50; 10-ft. wires, \$5. Double strength fuses, 1\$ extra, per 100 fuses. Fuses, time, double-tape, \$6 per 1,000 feet.

**Galvanized Iron.**—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, \$4.40; Comet, \$4.25; Gorbals' Best, \$4.25; Apollo, 10 1/4 oz., \$4.35. Add 25c. to above figures for less than case lots; 26-gauge is 25c. less than 28-gauge. American 28-gauge and English 26 are equivalents, as are American 10 1/4 oz., and English 28-gauge.

**Galvanized Pipe.**—(See Pipe, Wrought and Galvanized).

**Iron.**—Prices are rather higher, and the outlook is steady. The following prices are ex-store: Canadian pig, \$18.50 to \$19.50 per ton; No. 1 Summerlee, \$21 to \$22; No. 2 selected Summerlee, \$20.50 to \$21.50; Carron soft, \$20.25 to \$20.75; No. 3 Clarence, \$19 to \$20 per ton.

**Laths.**—See Lumber, etc.

**Lead.**—Trail lead is unchanged and steady, at \$3.70 to \$3.80 per 100 pounds, ex-store.

**Lead Wool.**—\$10.50 per hundred, \$200 per ton, f.o.b., factory.

**Lumber, Etc.**—Prices on lumber are for car lots, to contractors, at mill points, carrying a freight rate of \$1.50. At the moment, the market is exceptionally irregular and prices are uncertain. Red pine, mill culls out, \$18 to \$22 per 1,000 feet; white pine, mill culls, \$22 to \$25. Spruce, 1-in. by 4-in. and up, \$16 to \$18 per 1,000 ft.; mill culls, \$14 to \$16. Hemlock, log run, culls out, \$14 to \$15. Railway Ties: Standard Railway ties, hemlock or cedar, 35 to 45c. each, on a 5c. rate to Montreal. Telegraph Poles: Seven-inch top, cedar poles, 25-ft. poles, \$1.35 to \$1.50 each; 30-ft., \$1.75 to \$2; 35-ft., \$2.75 to \$3.25 each, at manufacturers' points, with 5c. freight rate to Montreal. Laths: Quotations, per 1,000 laths, at points carrying \$1.50 freight rate to Montreal, \$2 to \$3. Shingles: Cedar shingles, same conditions as laths, X, \$1.50; XX, \$2.50; XXX, \$3.

**Nails.**—Demand for nails is moderate, but prices are steady at \$2.30 per keg for cut, and \$2.25 for wire, base prices

**Pipe—Cast Iron.** The market continues steady at \$33 for 8-inch pipe and larger; \$34 for 6-inch pipe; \$34 for 5-inch, and \$34 for 4-inch at the foundry. Pipe, specials, \$3.10 per 100 pounds. Gas pipe is quoted at about \$1 more than the above.

**Pipe—Wrought and Galvanized.**—The market is steady, moderate-sized lots being: 1-4-inch, \$5.50 with 63 per cent. off for black, and 48 per cent. off for galvanized; 3/4-inch, \$5.50, with 59 per cent. off for black and 44 per cent. off for galvanized. The discount on the following is 60 per cent. off for black and 59 per cent. off for galvanized; 1/2-inch, \$8.50; 3/4-inch, \$11.50; 1-inch, \$16.50; 1 1/4-inch, \$22.50; 1 1/2-inch, \$27; 2-inch, \$36; 2 1/2-inch, \$57.50; 3-inch, \$75.00; 3 1/2-inch, \$95; 4-inch, \$118.

**Rails.**—Quotations on steel rails are necessarily only approximate and depend upon specification, quantity and delivery required. A range of \$1.50 to \$3.25 is given for 60-lb., 70-lb., 80-lb., 85-lb., 90-lb., and 100-lb. rails, per gross ton of 2,240 lbs., f.o.b. mill. Re-laying rails are quoted at \$27 to \$29 per ton, according to condition of rail and location.

**Railway Ties.**—See Lumber, etc.  
**Roofing.**—Ready roofing, two-ply, 64c. per roll; three-ply, 86c. per roll of 100 square feet. (See Building Paper; also Tar and Pitch.)

(Continued on Page 45)

# TENDERS CALLED FOR

## CITY OF LETHBRIDGE, ALBERTA, CANADA

### Tenders for Municipal Power Plant

Specifications, drawings and form of tender may be obtained from the Secretary-Treasurer, City of Lethbridge, Alberta, on and after the Fifteenth day of January, 1909. The following are the sections issued:

- |                             |                                     |
|-----------------------------|-------------------------------------|
| A. Boilers and Accessories. | H. Re-erection of Steam Engines.    |
| B. Economizer.              | I. Condensing Sets.                 |
| C. Feed Pumps.              | J. Crane.                           |
| D. Mechanical Draft.        | K. Switchboards, &c.                |
| E. Pipe work and Valves.    | L. Motor Generators & Transformers. |
| F. Steam Turbine Generator  | M. Buildings Steel Work, &c.        |
| G. Steam Engine Generator.  |                                     |

Tenders on any or all of the above sections, or any combination of the above sections will be received.

Tenders to be enclosed in a sealed envelope addressed "Tenders for Electric Plant" and to be delivered to the undersigned at the City Hall, Lethbridge, on or before the 1st day of March, 1909, and to remain open for acceptance for two (2) calendar months from that date.

Each tender must be accompanied by a certified cheque payable to the Secretary-Treasurer of the City of Lethbridge for 10% (Ten per cent.) of the amount of the tender, which will be returned to the tenderer, unless he fail to enter into contract for the work at the rate stated in the tender.

Plans and specifications may also be seen at the offices of Messrs. Smith, Kerry & Chace, Confederation Life Buildings, Toronto, Ontario, and the Carnegie Public Library Building, Winnipeg, Manitoba. The lowest or any tender not necessarily accepted.

A deposit of \$10.00 (Ten dollars) will be required for use of plans and specifications, which will be returned upon letting of contracts.

GEO. W. ROBINSON,  
Secretary-Treasurer.

## CITY OF WINNIPEG

### POINT DU BOIS HYDRO-ELECTRIC DEVELOPMENT

#### Tenders for Construction and Equipment

Sealed tenders on prescribed forms, addressed to the Chairman of the Board of Control, Winnipeg, Canada, and marked on the envelope "Point du Bois Hydro-Electric Development, tender for....." (here add the particular item or items as below) will be received at the office of the undersigned up to 11 a.m. on Tuesday, 2nd of March, 1909, for the supply and delivery of Insulators, the supply and delivery of material for and the erection of a telephone line between Point du Bois and Winnipeg, the erection of a Transmission line between Point du Bois and Winnipeg, and the supply and delivery of certain repair shop equipment.

Copies of the instructions to bidders, Plans, Specifications, and Forms of Tender may be obtained at the Power Engineer's Office, Carnegie Library Building, Winnipeg, Manitoba.

These specifications, plans, etc., may also be seen at the offices of Smith, Kerry & Chace, Confederation Life Building, Toronto, Ontario.

Each tender must be accompanied by a certified cheque, payable to the order of the City Treasurer for the sum called for in the corresponding "Instructions to Bidders," which cheque will become forfeit to the Corporation in the event of the successful tenderer refusing or neglecting to sign a satisfactory contract when called upon to do so.

Individual tenders will be received for:—

- 16—Insulators.
- \*3—Telephone Line.
- \*14—Erection of Transmission Line.
- 28A—Repair Shop Equipment.

As a further alternative, tenderers may include or group together number 3 and 14 providing that they have also tendered for each individually.

The Board reserves the right to reject any or all tenders or to accept any bid which shall appear advantageous to the City of Winnipeg.

M. PETERSON, Secretary.

Office of the Board of Control,  
Winnipeg, Man., Feb. 5th, 1909.

\* The numbers are those of the different volumes of specifications.

## CITY OF CALGARY

TENDERS will be received by the Commissioners of the City of Calgary and addressed to the undersigned marked "Tender for St. Railway material," until the 18th day of February next, 12 o'clock noon, for supplying to the City the following:

Covering approximately:—

- 397 Long tons 80-pound A. S. C. E. Steel rails.
- 746 Long tons 60-pound A. S. C. E. Steel rails.
- Together with certain special work, also spikes, bonds, Tie plates.
- Angle irons, track bolts, ties etc.
- 12 standard street railway cars.
- One street railway sprinkler.
- One street railway sweeper.

#### Overhead Construction.

- Steel span wire poles 30 ft. and 35 ft., three sections.
- Cedar poles.
- 12.5 miles of 2.0 trolley wire.
- 10.2 miles of 3.0 feed wire.
- Span wire.
- Hangers, Insulators and Conical strain insulators.
- Ears.
- Cross-overs and trolley frogs.

Bids will be received upon the entire schedule or any item of the same. A marked cheque covering 5 per cent up to \$10,000 and 2½ per cent over and above this sum of the amount bid will be required to accompany each and every tender.

Full particulars and specifications will be supplied at the City Engineer's Office.

The lowest or any tender not necessarily accepted.

H. E. Gillis,  
City Clerk.

Dated at Calgary, Jan. 20th, 1909.

## CITY OF CALGARY

TENDERS will be received by the Commissioners of the City of Calgary and addressed to the undersigned, marked "Tender for Boiler and Generator," until the 18th day of February next at 12 o'clock noon, for supplying to the City the following:

- 3 Water Tube Boilers equivalent to 1,000 H. P., with piping and induced draft system for 2,500 H. P.

Also

- 1 500 K.W. Generator connected to a 750 H. P. High Speed Engine for Railway System, with condenser, switch board, etc.

A certified check on a chartered bank in Canada for 2½ per cent. of the amount must accompany each tender. Separate offers may be made for any of the items set out herein. Plans and Specifications can be had on application to the City Engineer, Calgary, Alta.

The lowest or any tender not necessarily accepted.

H. E. Gillis,  
City Clerk.

Dated at Calgary, Jan. 20th, 1909.

## CITY OF SASKATOON

### PROVINCE OF SASKATCHEWAN

#### TENDERS FOR SUPPLIES

Sealed tenders will be received by the City Clerk until 8 p.m. on Monday, March 1st, 1909, for certain materials for Waterworks and Sewerage Works as follows:—

- Contract "D"—Cast Iron Pipes and Specials, 280 tons.
- " "E"—Fire Hydrants, Gate Valves, etc.
- " "F"—Sewer Pipes, 20,000 feet.
- " "G"—Pumping Machinery.

Plans and specifications may be seen at the office of the Chief Engineer, 103 Bay Street, Toronto, or at the office of the City Clerk, Saskatoon.

WM. HOPKINS, Esq.,  
Mayor,

J. H. TRUSDALE, Esq.,  
City Clerk,

Saskatoon, Sask. Saskatoon, Sask.

WILLIS CHIPMAN, C.E., Chief Engineer,  
103 Bay Street, Toronto, Ont.

# CONTRACTOR'S SUPPLIES

To know where to look for what you want, to know where to dispose of what you don't want is a great convenience. You require special equipment. This department will enable you to get in touch quickly with reliable men who wish to dispose of that which you require. Whether a buyer or a seller, you will find this department an aid to business.

RATES FOR THIS DEPARTMENT ARE VERY SPECIAL. BETTER SEND FOR THEM.

## FOR SALE

### FIRE BOX BOILERS.

- 1 refitted 48" x 20' containing 52-3" tubes.
- 1 refitted 44" x 18' containing 48-3" tubes.
- 1 refitted 44" x 18' containing 46-3" tubes.
- 1 new 39" x 14' 8" containing 36-3" tubes.
- 1 refitted 36" x 12' 11" containing 43-2 1/2" tubes.

### AUTOMATIC ENGINES.

- 1 13" and 23" x 30" L.H. compound, Wheelock.
- 1 refitted 14" x 34" R.H. Wheelock.
- 1 refitted 13" x 30" R. or L.H. Corliss.
- 1 refitted 12" x 30" R.H. Corliss.
- 1 refitted 12" x 10" Westinghouse Junior.
- 1 refitted 10" x 10" C.C. Leonard-Peerless.
- 1 new 10" x 15" R.H. Jewel.
- 1 refitted 9 1/2" and 14 1/2" x 12" C.C. tandem.
- 1 refitted 8" and 13" x 18" R.H. tandem.
- 1 rebuilt 7" x 10" C.C. Leonard-Ball.

### PORTABLE ENGINES AND BOILERS.

- 1 refitted 9" x 10" semi-portable engine and boiler.
- 1 refitted 8" x 12" semi-portable engine and boiler.
- 3 refitted 7" x 10" portable engines and boilers.

### CENTRIFUGAL PUMPS.

- 1 new 900-gallon vertical centrifugal pump.
- 1 new 735-gallon vertical centrifugal pump.
- 1 new 470 gallon vertical centrifugal pump.
- 1 new 260 gallon vertical centrifugal pump.
- 1 refitted 8" horizontal centrifugal sand pump.

A copy of our supply catalogue or machinery stock list for the asking.

**H. W. PETRIE, Ltd.**

Toronto Montreal Vancouver

## JARDINE UNIVERSAL CLAMP RATCHET DRILL

Indispensable for Machine Repairs, Factories, Machine Shops, Bridge Builders, Track Layers, Structural Metal Workers, have use for it. Send for description.

**A. B. JARDINE CO.,**  
HESPELER, ONT.

## Steam Shovels, Locomotives, Cars, etc.

Contractors' and Railway Equipment

Telegraph, Telephone or Write Us.

**A. C. TORBERT & CO.**  
547-548 Monadnock Block, CHICAGO.

## FOR SALE

Rails—New and second-hand  
Locomotives—Standard and narrow gauge.  
Contractor's Equipment.

**JOHN J. GARTSHORE**  
58 Front Street, West, TORONTO

(Continued from Page 7)

ooo; J. B. Fraser, W. H. A. Fraser, J. A. Story.

**Montreal.**—Honey Carriage & Harness Company, \$300,000; W. F. Honey, F. Arthur, R. M. Simpson, Westmount. Canada Fertilizer Company, \$175,000; E. M. Sliney, B. Stevens, P. S. Harney.

## FOR SALE. Great Bargains if you act promptly in D.C. MOTORS

1-500 volt, 15 Kilowatt. 900 R. 1-250 volt, 11 Kilowatt, 1150 R. 2-250 volt, 8 H.P. 1-250 volt, 10 H.P. 600 R. Built Specially for Hoisting Purposes.

All in First Class Order and no Reasonable Cash Offer refused.

WRITE, WIRE, OR CALL.

**ELEVATOR SPECIALTY CO.**  
Cor. Lombard and Church Sts., TORONTO

Canadian Light, Heat & Power Company, \$200,000; R. Locke, Westmount; R. Lacroix, H. L. Auger, Montreal. East Canada Smelting Company, \$1,000,000; J. R. Allen, New York; R. L. Clarke, Silverton; G. E. Smith, Sherbrooke. George Durnford, \$19,000; A. G. England, G. Durnford, P. Smith. Labrador Pulp and Lumber Company, \$1,500,000; E. Hutcheson, J. A. T. Richards, T. Stephens.

**Toronto.**—Hygiene Vacuum Company, \$20,000; J. S. Wilson, J. Boucher, T. Brethour, Ottawa. Gowganda Centre Silver Mines, \$1,000,000; C. G. Locke, D. R. Leask, R. Eustace. Saville Prospecting and Exploration Company, \$500,000; G. H. Sedgwick, F. V. Johns, L. Davis. F. R. Bartlett & Company, \$50,000; W. Gilchrist, C. Y. Spearing, T. Moss. Dufferin Gowganda Mines, \$1,000,000; G. H. Sedgwick, F. V. Johns, L. Davis. Producer Gas Construction Company, \$200,000; H. R. Ivor, J. H. Harvey, J. R. L. Starr. Blairton Iron Mines, \$40,000; J. L.

(Continued on Page 48.)

(Continued from Page 249)

**Rope.**—Prices are steady, at 9 1-2c. per lb. for sisal, and 12c. for Manila Wire Rope, crucible steel, six-strands, nineteen wires: 1/4-in., \$2.75; 5-16, \$3.75; 3/8, \$4.75; 1/2, \$6; 5/8, \$7.25; 3/4, \$8.50; 7/8, \$10; 1 in., \$12 per 100 feet.

**Shingles.**—See lumber, etc.

**Spikes.**—Railway spikes are in dull demand and prices are steady at \$2.40 per 100 pounds, base of 5/4 x 9-16. Ship spikes are also dull and steady at \$2 per 100 pounds, base of 3/4 x 10-inch and 3/4 x 12-inch.

**Steel Shafting.**—Prices are steady at the list, less 25 per cent. Demand is on the dull side.

**Steel Plates.**—The market is steady. Quotations are: \$2.15 for 3-16, \$2.21 for 1/8, and \$2.15 for 1/4 and thicker; 12-gauge being \$2.30; 14-gauge, \$2.15; and 16-gauge, \$2.10.

\* \* \* \*

Winnipeg, February 9th, 1909.

The price of lumber in Winnipeg has taken a jump. Instead of the usual discount of 25 per cent., a discount of only 5 per cent. is now being allowed, and if the price keeps up a change in the list will take place, and it is expected that this will be the case. All lumber bought since the first of February has only been allowed the small discount. This increase in the price of lumber has taken place, it is reported on account of the great renewal of the building trade which is undoubtedly to take place in the West this year.

It is reported that the building permits for February in Winnipeg total already four times as large as the total of the whole of February last year.

The Canadian Northern Railway are planning extensive improvements to their shops, and the contract has been awarded for the erection of their new freight shed at Saskatoon, the contract going to Samuel Brown, of Winnipeg, at the price of \$20,000. Work will be commenced on it immediately.

Messrs. John Gunn & Sons have placed a very large order for cement with an eastern cement company for 80,000 barrels of Portland cement, which will be used on the Municipal Power Plant at Point du Bois, for which Messrs. Gunn & Sons are the contractors. It is stated that it is the largest single order for cement ever placed in Canada.

Quotations on the local market are as follows:—

**Anvils.**—Per pound, 10 to 12 1/2c.; Buckworth anvils, 80 lbs., and up, 64c.; anvil and vise combined, each, \$5.50.

**Bar Iron.**—\$2.50 to \$2.60.

**Beams and Channels.**—\$1 to \$3.25 per 100 up to 12-inch.

**Building Paper.**—1/4 to 7c. per pound. No. 1 tarred, 8c. per roll; plain, 6c.; No. 2 tarred, 6 1/2c.; plain, 5c.

**Bricks.**—\$11, \$12, \$13 per 1,000, three grades.

**Cement.**—\$2.65 to \$2.75 per barrel.

**Chain.**—Coil, proof, 1/4-inch, \$7; 5-16-inch, \$5.50; 3/8-inch, \$4.90; 7-16-inch, \$4.75; 1/2-inch, \$4.40; 5/8-inch, \$4.20; 3/4-inch, \$4.05; logging chain, 5-16-inch, \$6.50; 3/8-inch, \$6; 1/2-inch, \$8.50; jack iron, single, per dozen yards 15c. to 75c.; double, 25c. to \$1; trace-chains, per dozen, \$5.25 to \$6.

**Dynamite.**—\$11 to \$13 per case.

**Hair.**—Plaster's, 80 to 90 cents per bale.

**Hinges.**—Heavy T and strap, per 100 lbs., \$6 to \$7.50; light, do., 65 per cent.; screw hook and hinge, 6 to 10 inches, 5 1/4c. per lb.; 12 inches up, per lb., 4 1/4c.

**Iron.**—Swedish iron, 100 lbs., \$4.75 base; sheet, black, 14 to 22 gauge, \$3.75; 24-gauge, \$3.90; 26-gauge, \$4; 28-gauge, \$4.10. Galvanized—American, 18 to 20-gauge, \$4.40; 22 to 24-gauge, \$4.65; 26-gauge, \$4.65; 28-gauge, \$4.90; 30-gauge, \$5.15 per 100 lbs. Queen's Head, 22 to 24-gauge, \$4.65; 26-gauge English or 30-gauge American, \$4.90; 30-gauge American, \$5.15; Fleur de Lis, 22 to 24-gauge, \$4.50; 28-gauge American, \$4.75; 30-gauge American, \$5.

**Lead Wool.**—\$10.50 per hundred, \$200 per ton, f.o.b., Toronto.

**Pipe.**—Iron, black, per 100 feet, 1/4-inch, \$2.50; 3/8-inch, \$2.80; 1/2-inch, \$3.40; 3/4-inch, \$4.60; 1-inch, \$6.60; 1 1/4-inch, \$9; 1 1/2-inch, \$10.75; 2-inch, \$14.40; galvanized, 3/8-inch, \$4.25; 1/2-inch, \$5.75; 1-inch, \$8.35; 1 1/4-inch, \$11.15; 1 1/2-inch, \$13.60; 2-inch, \$18.10. Lead, 6 1/4c. per lb.

**Picks.**—Clay, \$5 dozen; pick mattocks, \$6 per dozen; cleavishes, 7c. per lb.

**Pitch.**—Pine, \$6.50 per barrel; in less than barrel lots, 4c. per lb.;

roofing pitch, \$1. per cwt.

**Plaster.**—Per barrel, \$3.

**Roofing Paper.**—60 to 67 1/2c. per roll.

(Continued on Page 47)

## CITY OF BRANDON, Manitoba

Applications for the position of City Engineer will be received by the undersigned up to Four o'clock p.m., March 1st, 1909. Duties to commence April 1st, 1909. Applicants to state qualifications.

HARRY BROWN, City Clerk.

## AMONG THE MANUFACTURERS

A department for the benefit of all readers to contain news from the manufacturer and inventor to the profession.

### GROWTH OF THE GAS ENGINE.

A recent example of the growing popularity of the Suction Producer Gas Engine is found at Blackwood's Brewery, Winnipeg, where a Paxman Gas Engine is replacing a Corliss steam engine.

The engine is of 50 horse-power and is to drive the compressor of the refrigerator plant. It is designed to run on anthracite coal, and on the makers guarantee, a very considerable reduction of the working expenses will result.

As the plant is the first of its kind, installed in Winnipeg, its operation will be watched with considerable interest, by power users.

The engine is made by the well-known firm of Davey, Paxman & Company, of Colchester, England, and is supplied through their Canadian agents, The Brydges Engineering & Supply Company, Limited, Winnipeg.

The plant will be in operation by the end of February, and no doubt many Western manufacturers will take advantage of the opportunity of seeing at work, what is claimed to be the cheapest form of motive power.

Situated on the banks of the Red River facing Rosser Avenue, the brewery occupies an area of ten acres. Not only is the plant an extensive one, but it is up-to-date, and first-class in every respect, and equipped with the latest and most approved machinery and appliances for the manufacture of pure beer.

To carry out the company's intention of providing only the best beverage, they have erected a strictly modern building, with every fire-proof appliance which could be obtained. The building is built of brick and iron throughout, with concrete floors, and occupies a large ground floor space, with three stories and tower, the whole combining to make one of the most commanding structures on the banks of the Red River.

### PERSONAL.

MR. J. T. CHILD, formerly consulting engineer, Calgary, Alta., has been appointed city engineer for that municipality.

MR. E. A. TURNER, of Montreal, has been appointed local manager of the Montreal Transportation Company at Kingston.

DR. EUGENE HAANEL, Director of Mines, Ottawa, has returned from an important visit to Sweden, where he has been inspecting a new electric smelting process.

MESSRS. ALLAN FINDLAY and Samuel E. McCall, of Winnipeg, have been granted commissions as Manitoba Land Surveyors.

MR. E. W. HUBBELL, D.L.S., Ottawa, has been appointed special examiner of candidates to be articulated pupils and for commissions as Dominion Land Surveyors.

PRESIDENT ELLIOT, of the Northern Pacific, and L. P. Gilman, assistant to the president of the Great Northern, were in Vancouver last week to confer with the city authorities concerning the location of joint terminals on False Creek, in the east end of the city.

MR. ROLAND YEATES, of the London Machine Tool Company, and Mr. Rudel, formerly of the Canadian Fairbanks Company, Ltd., have formed a partnership. Both men have a wide experience in machinery lines, and they intend handling a full line of tools.

MR. W. F. DEAN, mill engineer and architect, Boston, Mass., is acting for the City of Baltimore, Md., in the matter of valuation of plant and property of the Warren Manufacturing Company, Warren, Md., in which are concerned some interesting questions as to the value of an old water power

### A COMBINATION PUMP.

The introduction of a new combination pump into the many systems of heating both by live and exhaust steam, has been followed by gratifying results. The economic and simple features are generally recognized. The pump is a vacuum and boiler feed combined in one, and driven as an ordinary duplex steam pump, each having its own suction and discharge separate. The purpose for which it was designed, was to be used in connection with steam heating systems, especially where the ordinary gravity low pressure systems are installed, whereby a simple alteration of piping and with one of these pumps can be converted into a vacuum heating system, giving much better results, a more even heat absolutely noiseless, and a reduction in the consumption of fuel. With double combination vacuum pumps a heating system can be compounded by dividing it into two sections, and the condensation from the first being pumped into the second is again flashed into steam, by using a higher vacuum, which again condenses and is then pumped back to the boiler, or atmosphere. A number of these pumps connected to heating systems have been installed, and are operating both live and exhaust steam, which are giving good results. They can also be used on double and triple effects, in laundries, confectioneries, distilleries, breweries, etc. Also as air and circular pumps for surface condensers. The Canada Steam Pump and Machine Company, Limited, 97 Richmond Street East, Toronto, are the makers who have applied for the patent.

### CATALOGUE RECEIVED.

Oil Switches and Circuit-Breakers are listed in Bulletin No. 4 of the Kelman Electric & Manufacturing Company, 194 Lefferts Place, Brooklyn, N.Y., which also contains interesting descriptions of high voltage oil circuit-breakers and an electrically operated oil switch.

with supplementary steam power as compared with that of a modern steam plant for the development of all power.

### OBITUARY.

MR. NORMAN F. PEDLEY, of Montreal, Stud. Mem. Can. Soc. C.E., who was employed as a surveyor by the Illinois Traction System, died at Springfield, Ill., January 18th, 1909. His death was the result of his being struck by a train several days before on the Chicago & Alton tracks five miles south of Springfield. Mr. Pedley was a graduate of McGill University and was about 24 years old.

MR. J. G. McGRATH, C.E., one of the engineers in charge of the construction of the Victoria Bridge, Montreal, died in London, Eng., January 11th, 1909. Mr. McGrath was born in England and returned there after over thirty years spent in Canada. He was also connected with the work upon the Intercolonial and Northern Railway, being associated with Messrs. Peto and Brassey in this work, as well as other important undertakings in this country. In 1861, at the time of the Trent affair, Mr. McGrath and others raised an engineer corps, which later became the present Royal Grenadiers. He also volunteered for service with the Queen's Own Rifles of Toronto in the Fenian Raid, and was at the time of his death a member of the Toronto Veterans' Association of 1866. In the Crimean War times he held a commission in the army and saw active service around Sebastopol. On returning to England in 1855 he was engaged on the construction of the Manchester ship canal, and later on the Buenos Ayres docks. He retired from active life about ten years ago.

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(Continued from Page 45)

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**Boards.**—Common pine, 8-inch to 12-inch wide, \$38 to \$45; siding, No. 1 white pine, 6-inch, \$55; cull red or white pine or spruce, 6-inch, \$24; No.

1 clear cedar, 6-inch, 8 to 16 ft., \$60; Nos. 1 and 2 British Columbia spruce, 6-inch, \$55; No. 3, \$45.

**Flooring.**—No. 2 red pine, 4-inch, \$43; No. 3 red, 4-inch, \$38; No. 4 red and white pine or spruce, 4-inch, \$28; ceiling, No. 2 white pine, 4, 6 and 6-inch, \$55; No. 3 red pine, \$38.

**Lath.**—No. 1 red and white pine mixed, \$5.50; No. 2, \$4.75.

**Shingles.**—No. 1 British Columbia cedar, \$4.25; No. 2, \$3.75; band sawn, \$6.

**Rope.**—Cotton, ¼ to ½-in. and larger, 23¼c. lb.; deep sea, 18c.; lath yarn, 9¼c.; pure Manila, per lb., 13¼c.; British Manila, 11¼c.; sisal, 10¼c.

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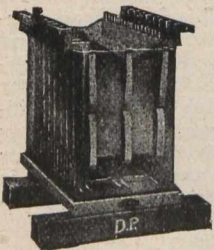
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(Continued from Page 45)

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### PIG IRON OUTPUT.

Pig iron production in Canada during 1908 totalled 563,672 tons, as compared with 581,146 tons in 1907, a decrease of 17,474 tons, or about 3 per cent.

In the first half of 1908 the production amounted to 307,074 tons, and in the second half to 256,598 tons, a decrease of 50,476 tons.

At Youngstown, Ohio, last year, the city water after leaving the filter plant had an average per centage of 98.34 of purity for the year, a very good efficiency for the filters. The annual report of G. R. Patton, superintendent of the filter plant, shows beyond this that during the year there was an estimated daily average of 6,612,000 gallons of water filtered at the plant. An average of 2,060 pounds per day of alum was used during the year. The daily average of bacterial points per cubic centimetre in the river water was 29,490 and in the filtered water 362 per cubic centimetre. The total rainfall for the last seven months of the year was 16.99 in.

Persons who are familiar with guarantees of steam consumption, which accompany sales of high speed engines, are aware that these guarantees are usually met under the conditions of shop tests. Particular interest, therefore, attaches to a report by Mr. F. W. Dean, mill engineer and architect, Boston, regarding a series of tests upon generating sets with various types of engines of moderate size which have been in operation for relatively long periods. With one exception the period of service ranged from 5,000 to over 30,000 hours. The results show that no engine realized economies which would have been guaranteed. Mr. Dean concludes that we are justified in thinking that most high speed engines rapidly deteriorate in economy, but that on the contrary, slower running Corliss or grid-iron valve engines improve in economy for many years. As it is difficult to see that the speed is the cause of this, it is reasonable to assume that it must depend on the nature of the valve.

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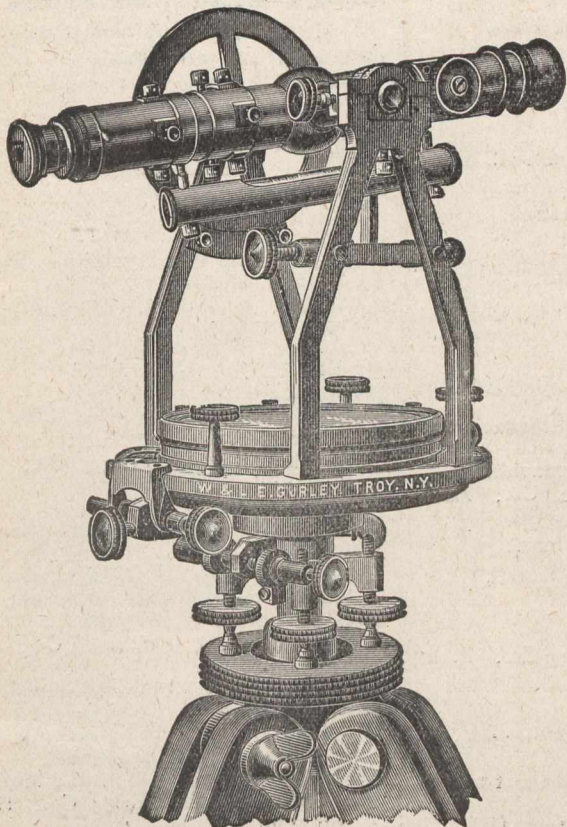
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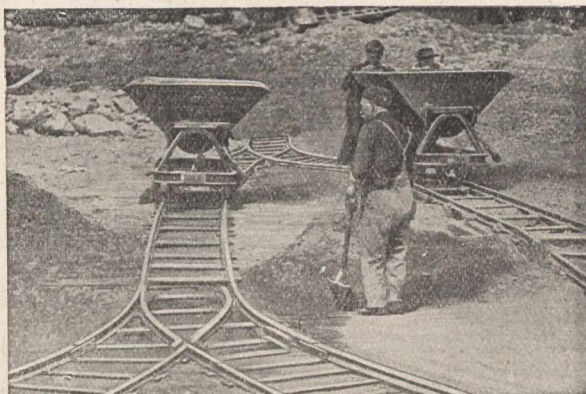
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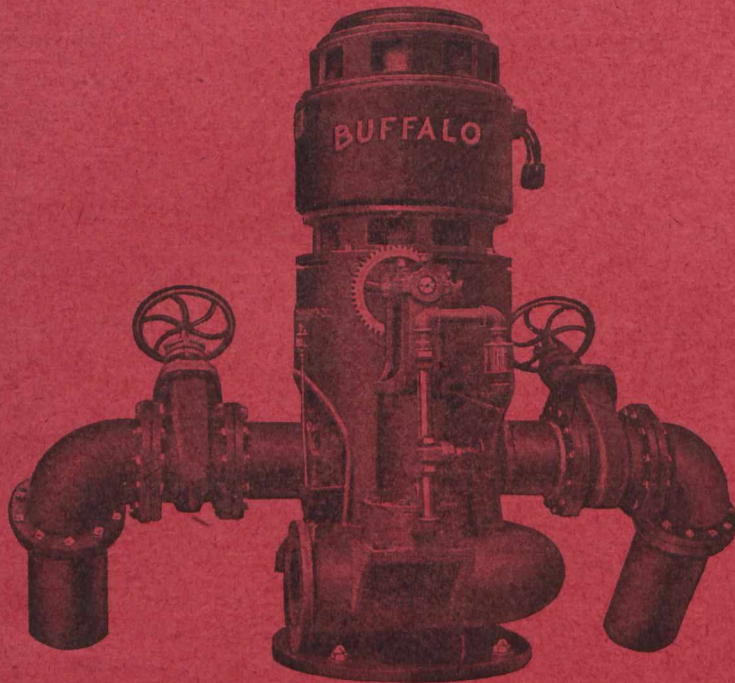
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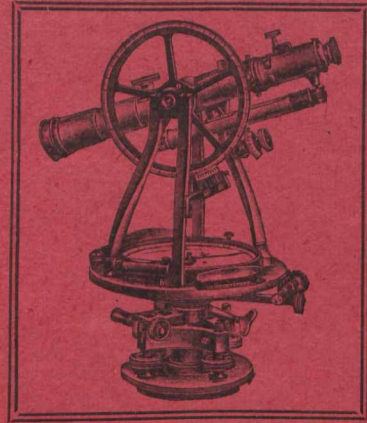
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